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AN ACCOUNT

OF

METEOROLOGICAL AND PHYSICAL OBSERVATIONS

IN

EIGHT BALLOON ASCENTS,

MADE AT

THE REQUEST OF THE COMMITTEE.

BY

JAMES GLAISHER, F.R.S.

COMMITTEE.

Colonel Sykes,	Dr. Lee,
Professor Airy,	Dr. Robinson,
Lord Wrottesley,	Mr. Gassiot,
Sir D. Brewster,	Mr. Glaisher,
Sir J. Herschel,	Dr. Tyndall,
Dr. Lloyd,	Mr. Fairbairn,
Admiral FitzRoy,	Dr. W. A. Miller.

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THE objects to which the Committee resolved to devote their principal attention were the determination of the temperature and hygrometric condition of the air at different elevations above the earth's surface. In addition to which, several other secondary objects were to be carried out if possible, as follows:—

§ 1. Objects of the Experiments.

The *primary* objects were—

The determination of the temperature of the air, and its hygrometrical states, at different elevations, as high as possible.

The *secondary* objects were—

To determine the temperature of the dew-point by Daniell's dew-point hygrometer, by Regnault's condensing hygrometer, and by dry- and wet-bulb thermometers as ordinarily used, as well as when under the influence of the aspirator; so that considerable volumes of air were made to pass over both their bulbs, at different elevations, as high as possible, but particularly up to those heights where man may be resident, or where troops may be located, as in the high lands and plains in India, with the view of ascertaining what confidence may be placed in the use of the dry- and wet-bulb thermometers at those elevations, by comparison with the results as found from them, and with those found directly by Daniell's and Regnault's hygrometers, and to compare the results as found from the two hygrometers together.

To compare the readings of an aneroid barometer with those of a mercurial barometer up to 5 miles.

To determine the electrical state of the air.

To determine the oxygenic condition of the atmosphere by means of ozone papers.

To determine the time of vibration of a magnet on the earth, and at different distances from it.

To collect air at different elevations.

To note the height and kind of clouds, their density and thickness.

To determine the rate and direction of different currents in the atmosphere, if possible.

To make observations on sound.

To note atmospherical phenomena in general, and to make general observations.

Instruments and Apparatus.

The instruments used were mercurial and aneroid barometers; dry- and wet-bulb thermometers; Daniell's dew-point hygrometer; Regnault's condensing hygrometer; maximum and minimum thermometers; a magnet for

horizontal vibration; hermetically sealed glass tubes from which air had been exhausted; ozone papers; and an electrometer lent by Prof. W. Thomson of Glasgow.

Barometers.—The mercurial barometer employed in all the ascents was a Gay-Lussac's siphon barometer by Mr. P. Adie, and is one of those used by Mr. Welsh in the year 1852 in his experiments. The inner diameter of its tube is 0·25 inch. The graduations were made on a brass scale, from its middle point upwards and downwards; each division was about 0·05 inch in length, representing twice that value, so that an observation of either the lower or upper surface of the mercury would give the approximate length of the column of mercury.

The readings of the upper end were alone taken, and the corrections applicable to this end have been applied to all observations.

The barometer was furnished with its own thermometer, whose bulb was immersed in a tube of mercury of the same diameter as that of the barometer.

This instrument sometimes read more than 20° in excess of that of the sensitive air-thermometer.

The aneroid barometers were made by Messrs. Negretti and Zambra; one was graduated to 13 inches, and the other to 5 inches—the latter instrument having been used in the ascents on August 18 and September 5, and the former on July 17. In consequence of a difference of reading between the aneroid and mercurial barometers on July 17 (and as both instruments were broken, it was impossible to say which was in error), and as the correctness of the siphon barometer at low readings is dependent upon the evenness of the tube, another barometer was used in addition on September 5, made by and at the suggestion of Messrs. Negretti and Zambra, as follows:—

A tube 6 feet in length was filled with mercury and boiled throughout its whole length; a glass cistern was blown on the bottom of the tube, and bent upwards in the form of a siphon; a stopcock was placed between the tube and cistern, and whilst the mercury filled the entire tube, a mark was made on the cistern, at the level of the mercury in it, for zero; the stopcock was then gradually opened, and the mercury allowed to descend one or more inches. The rise which consequently took place in the cistern was carefully marked on the same side as "0" (zero); the stopcock was again opened and the same operation was repeated until 30 inches of mercury had left the upper part of the tube, and the successive levels of the mercury in the cistern had been accurately marked.

In finally making the barometer, the upper portion only of the tube was used; the cistern which had been at the end of the lower portion was removed and joined on the upper; and in graduating the scale of the barometer, the rise which took place in the cistern at every inch was deducted, and the scale reduced in its entire length, by the exact amount of the rise of the mercury in the cistern. This instrument was therefore probably as accurate at low readings as at high.

Dry- and Wet-Bulb Thermometers.—Two pairs of dry- and wet-bulb thermometers were employed; one pair as ordinarily used, their bulbs being protected from the direct rays of the sun by a double highly polished silver shade, in the form of a frustum of a cone, open at top and bottom. A cistern was fixed near to them, from which water was conveyed to the wet-bulb thermometer.

The bulbs of the second pair of dry- and wet-bulb thermometers were enclosed in two silver tubes placed side by side, and connected together by a cross tube joining their upper ends, and over both were placed double

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shades as in the other pair of thermometers. In the left-hand tube was placed the dry-bulb, and in the right-hand tube the wet-bulb thermometer. Towards the lower end of the left-hand tube there was an opening; by means of the aspirator a current of air was drawn in at this aperture, then passed the dry-bulb in its upward passage into the small horizontal tube, and from thence into the right-hand tube, passing downwards over the wet-bulb, and away by a flexible tube into the aspirator. These instruments were made by Messrs. Negretti and Zambra.

Regnault's Condensing Hygrometer.—This instrument was made with two thermometers, as described by Regnault in the 'Annuaire Météorologique de la France' for 1849, page 221, excepting that it was furnished with silver-gilt cups. The scale was of ivory, and the two thermometers were fixed in their cups by means of cork, for ready packing up. The instrument was made by Messrs. Negretti and Zambra.

Daniell's Hygrometer was of the usual construction, by Messrs. Negretti and Zambra.

Exhausted Tubes for collecting Air.—These tubes were partly constructed by Messrs. Negretti and Zambra, and partly by Mr. Casella.

The thermometers employed in the observations were exceedingly sensitive; the bulbs were long and cylindrical, being about $\frac{3}{4}$ths of an inch in length, and $\frac{1}{12}$th of an inch in diameter. The graduations, extended to minus 40°, were all on ivory scales. These thermometers, on being removed from a room heated 20° above that of an adjoining apartment, acquired the temperature within half a degree in about 10 or 12 seconds; but in passing from a heated apartment to one of a lower temperature, it took more than double the time to approximate to within half a degree of the latter. They were so sensitive that scarcely any correction is required to be applied to them on account of sluggishness; and this was found to be the case by the very near agreement in the temperatures at the same height in the ascending and descending curves, in those cases where there was reason to believe that there had been no change of temperature at the same height, within the interval between the two series of observations.

§ 2. Observing Arrangements.

One end of the car was occupied by Mr. Coxwell; near the other, in front of myself, was placed a board or table, the extremities of which rested on the sides of the car; upon this board were placed suitable framework to carry the several thermometers, hygrometers, magnet, aneroid barometer, &c.; a perforation through it admitted the lower branch of the mercurial barometer to descend below, leaving the upper branch at a convenient height for observing. A watch was set to Greenwich time, and placed directly opposite to myself. The central space of the table was occupied by my note-book. The aspirator was fixed underneath the centre of the board, so as to be conveniently workable by either my feet or hands. Holes were cut in the board to admit the passage of the flexible tubes, one of which passed to Regnault's hygrometer, and the other to the place of the dry- and wet-bulb thermometers previously referred to, both the tubes being furnished with stopcocks.

Circumstances of the Ascents, and General Observations.

The ascents were all made by Mr. Coxwell's large balloon,—three from Wolverhampton, four from the Crystal Palace, Sydenham, and one from Mill Hill, near Hendon, where the balloon had fallen the evening previous, and had been anchored during the night.

Ascent from Wolverhampton, July 17.—The balloon was inflated at the Stafford Road Gas-works, Wolverhampton, with carburetted gas, most carefully prepared by the Engineer, Mr. Thomas Proud, and frequently kept a long time for our use, the Directors of the Gas Company having most liberally, to their great inconvenience, placed a gasometer at our disposal for as long a time as we needed it. To the Directors of the Company and to Mr. Proud our best thanks are due; for on all occasions they showed the utmost anxiety to contribute to the success of the experiments, in which Mr. Joseph Walker, Mr. Joseph Cooper, and Mr. Proud took great interest.

The weather previously had been bad for a long time, and the ascent had been delayed some days in consequence; the wind was still blowing strongly from the West; and considerable difficulty was experienced in the preliminary arrangements, and no instrument was placed in its position before starting. The ascent took place at 9^h 43^m A.M.; at once the balloon was quiescent. A height of 3800 feet was reached before an observation could be taken; at 4000 feet clouds were entered, which were left at 8000 feet. The temperature of the air fell to 33°, and a height exceeding 10,000 feet had been passed before all the instruments were in working order. The sky was then noticed to be of a deep-blue colour, without a cloud of any kind upon its surface.

At starting, the temperature of the air was 59°, and dew-point 55°; at 4000 feet it was 45°, dew-point 33°, and descended to 26° at 10,000 feet, dew-point 19°, and then there was no variation of temperature between this height and 13,000 feet. During the time of passing through this space, both Mr. Coxwell and myself put on additional clothing, feeling certain that we should experience a temperature below zero before we reached 5 miles high; but to my surprise, at the height of 15,500 feet, the temperature, as shown by all the sensitive instruments, was 31°, dew-point 25°; and at each successive reading, up to 19,500 feet, the temperature increased, and was here 42°, dew-point 24°. We had both thrown off all extra clothing. Within two minutes after this time, when we had fallen somewhat, the temperature again began to decrease, with extraordinary rapidity, and was 16°, or 27° less than it was 26 minutes before: at this time a height of 5 miles had been reached, at about 11 A.M.

When the balloon had attained a height of 4 miles, I wished to descend for one or two miles and then to re-ascend; but Mr. Coxwell, who had been watching its progress with reference to the clouds below, felt certain that we were too near the Wash; prudence therefore caused us to abandon the attempt.

Our descent began a little after 11 A.M., Mr. Coxwell experiencing considerable uneasiness at our too close vicinity to the Wash; we came down quickly, passing from a height of 16,300 feet to one of 12,400 feet between 11^h 38^m and 11^h 39^m; dipping into a dense cloud at this elevation, which proved to be no less than 8000 feet in thickness, and whilst passing through this the balloon was invisible from the car. Mr. Coxwell had reserved a large amount of ballast, which he discharged as quickly as possible to check the rapidity of the descent; but notwithstanding all his exertions, as we collected weight by the condensation of that immense amount of vapour through which we were passing, the descent was necessarily very rapid, and we came to the earth with a very considerable shock, which broke nearly all the instruments. All the sand was discharged when we were at a considerable elevation; the amount we had at our disposal at the height of 5 miles was

fully 500 lbs.; this seemed to be more than ample, and, when compared with that retained by Gay-Lussac, viz. 33 lbs., and by Rush and Green, when the barometer reading was 11 inches, viz. 70 lbs., seemed indeed to be more than we could possibly need, yet it proved to be insufficient.

The descent took place at Langham, near Oakham in Rutlandshire, in a meadow near the residence of Mr. E. G. Baker, from whom we received the utmost attention.

Ascent from the Crystal Palace, July 30.—A table was fixed to the side of the car, partly within and partly without. The instruments were placed on a framework, fixed to the part of the table outside, so as to be beyond the influence of the occupants of the car; my note-book, watch, and aneroid barometer rested on the inner part of the table. The air was in gentle motion from the south-west, enabling the instruments to be made ready for observation before starting, and at 4^h 40^m P.M. the balloon left the earth.

The temperature declined instantly. Observations were taken every minute or half-minute from the time of ascent, to as near as possible the time of descent.

The readings of one barometer were kindly made by Mr. W. F. Ingelow, and he also assisted me in observing the first appearance of dew on the hygrometer.

A height of 7000 feet was reached at about 6 o'clock, and the descent began about a quarter past 6; it was rather rapid, but quite under control, and we reached the earth at the village of Singlewell, near Gravesend, at 6^h 30^m.

Ascent from Wolverhampton, August 18.—The weather on this day was favourable; there was but little wind, and that blowing from the N.E. By noon the balloon was nearly inflated, and as it merely swayed in a light wind, all the instruments were fixed before starting, and at 1^h 2^m 38^s P.M. Mr. Coxwell pulled the spring-catch; for a moment the balloon remained motionless, and then rose steadily almost perpendicularly: this ascent was all that could be desired. In about 10 minutes we passed through a fine cumulus cloud, and then emerged into a clear space with a beautiful blue sky dotted over with cirrus clouds above. When at the height of nearly 12,000 feet, with the temperature of 38°, or 30° less than on the ground, and dew-point 26°, Mr. Coxwell discharged gas, and we descended to a little above 3000 feet at 1^h 48^m; a very gradual ascent then took place till 2^h 30^m, when a height of about 24,000 feet was obtained; and here a consultation took place as to the prudence of discharging more ballast or retaining it, so as to ensure a safe descent; ultimately it was determined not to go higher, as some clouds, whose thickness we could not tell, had to be passed through. The descent began soon after, and we reached the earth a little after 3 o'clock at Solihull, about 7 miles from Birmingham.

Ascent from the Crystal Palace, August 20.—The air was almost calm, the instruments were all fixed before starting, and the balloon left the Crystal Palace at 6^h 26^m P.M., the temperature at the time being 66°, dew-point 54°. By 6^h 35^m we were half a mile high, the temperature being 56°. At 6^h 37^m the height of three-quarters of a mile was attained, and the air was so tranquil that we were still over the Palace. At 6^h 43^m, when at the height of nearly a mile, a thick mist or thin cloud was entered, the earth being just visible. The temperature at this time was 50°, dew-point 46°; this elevation and temperature were maintained for about five minutes, and we then descended 200 or 300 feet. Kennington Oval was in sight. At 7^h 9^m St. Mark's Church, Kennington, was exactly underneath us. We were now about a

mile in height, with a temperature of 48°, and dew-point 46°; the hum of London was heard, and there was scarcely a breath of air stirring.

A descent was gradually made to 1200 feet by 7^h 20^m; the lamps were being lighted over London, the hum of London greatly increasing in depth. At this time shouting was heard of people below who saw the balloon; a height of between 1500 and 2500 feet was maintained till 7^h 40^m, the temperature varying from 57° to 54° and dew-point about 47°. The river appeared dull, but the bridges that spanned it, as well as street after street as lighted up, and the miles of lights, sometimes in straight lines, sometimes winding like a serpent, or in some places forming a constellation at some place of amusement, constituted a truly remarkable scene, associated as this appearance was with the deep sound, or rather roar of the traffic of the metropolis.

For a considerable time Kennington Oval and Milbank Penitentiary were in sight, and it seemed as though we could not get away from them. At 7^h 40^m Mr. Coxwell determined to ascend above the clouds. We were then about 2500 feet high, and the temperature was 53°, dew-point 46°. At 7^h 42^m a height of 3500 feet was attained, the temperature being 51°. At 7^h 47^m a height of one mile had been reached, and the temperature was 45°, dew-point 42°. It was very dark below, but there was a clear sky above, and a beautiful gleam of light appeared. We still ascended till the clouds were below us, tinged and coloured with a rich red: the temperature had now fallen to 43°; we were soon enveloped in a fog again. At 7^h 52^m the striking of a clock and the tolling of a bell were heard. It was quite dark below, but the sun tinged the tops of the clouds. At 8^h 5^m we were quite above the clouds, and it became light again; the hum of London gradually died away. By this time the temperature had increased to 55°, the barometer reading 23 inches, corresponding to a height of 7400 feet. After this we descended, and it became too dark to read the instruments. London again was seen, very different indeed in its appearance from when we could pick out every square, street, bridge, &c. by its lights; now, as seen through the mist, it had the appearance of a large conflagration of enormous extent, and the sky was lit up for miles around. After a time the lowing of cattle was heard, and we seemed to have left London, so Mr. Coxwell determined to pass through the clouds and examine the country beneath. We passed from the comparative light above to the darkness beneath, momentarily becoming darker, and found ourselves some little distance from London, and shortly afterwards touched the ground, so gently that we were scarcely aware of the contact, in the centre of a field at Mill Hill, about one mile and a half from Hendon, and it was resolved to anchor the balloon for the night, with the view of making an early morning ascent.

Ascent from Mill Hill near Hendon, August 21.—By half-past 4 A.M. the instruments were replaced, and the earth was again left. It was a dull, warm, cloudy morning, still rather dusk, the sky overcast with cirrostratus cloud. The temperature was nearly as high as 61°, and dew-point 59°. There were in the car, besides Mr. Coxwell and myself, Captain Percival, of the Connaught Rangers, Mr. Ingelow, and my son.

We at first rose very slowly; at 4^h 38^m we were 1000 feet high, and the temperature was 58°, dew-point 56°. At 4^h 41^m there was a break in the clouds to the east, and a beautiful line of light with gold and silver tints. Here and there, the morning mist was sweeping. At 4^h 51^m the temperature was 50°, and dew-point 42°; scud was below us, and the cloud of night was in a transition state into cumulus, or the cloud of day, at the same level as we were, viz. about 3500 feet; black clouds were above,

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and mist was creeping along the ground. At $4^h\ 55^m$ we were above a mile high; the temperature was 43°, dew-point 42°; we were just entering cloud. At $4^h\ 57^m$ we were in cloud, surrounded by white mist; the temperatures of the air and the dew-point were alike, viz. $39\frac{3}{4}$°. The light rapidly increased, and gradually we emerged from the dense cloud into a basin surrounded by immense black mountains of cloud rising far above us; shortly afterwards we were looking into deep ravines of grand proportion, bounded with beautiful curved lines. The sky immediately overhead was blue, dotted with cirrus clouds.

As we ascended, the tops of the mountain-like clouds became silvery and golden. At $5^h\ 1^m$ we were level with them, and the sun appeared, flooding with golden light all the space we could see for many degrees both right and left, tinting with orange and silver all the remaining space around us. It was a glorious sight. At $5^h\ 10^m$ a height of 8000 feet had been attained, and the temperature had increased from $38\frac{1}{2}$° in the cloud to 41°. We still ascended, rather more quickly as the sun's rays fell upon the balloon, each instant opening to us ravines of wonderful extent, and presenting to our view a mighty sea of clouds. Here arose shining masses of cloud in mountain chains, some rising perpendicularly from the plain, dark on one side, and silvery and bright on the other, with summits of dazzling whiteness; some were of a pyramidal form, and a large portion undulatory or wavy, in some places subsiding into hollows, and in one place having the appearance of a huge lake; on the extremity of the horizon snowy peaks bounded the view, resembling Alpine ranges. Nor was the scene wanting in light and shade: each large mass of cloud cast a shadow, and this circumstance, added to the very many tints, formed a beautiful scene. At $5^h\ 16^m$ we were nearly two miles high, the temperature was 32°, and dew-point 13°; the air was therefore dry. At $5^h\ 18^m$ we were above two miles in height; the temperature was 31°, and dew-point 10°. By $5^h\ 31^m$ we were something less than three miles high; the temperature was 23°, and dew-point —15°, and it decreased to 19° by $5^h\ 34^m$. This elevation was maintained for half an hour, during which time the temperature increased 5° or 6° as the sun's altitude increased. Shortly after 6 o'clock it was determined to descend; the temperature, which had been as high as 27°, had fallen to 23°. At $6^h\ 13^m$, at the height of $2\frac{1}{4}$ miles, we heard a train. At $6^h\ 20^m$ we were two miles high, and the temperature had increased to 39°, and dew-point to 19°: at this time I noticed the loud ticking of a watch; Captain Percival said he could not hear it; he was seated, and I was standing; and some experiments were made, when it was found that when the ear was at the same level as the watch, no sound was heard, but it was remarkably distinct on the ear being situated above it.

At the height of two miles the barking of a dog was heard; the temperature at this time ($6^h\ 24^m$) was 43°, and dew-point 10° lower. The shadow of the balloon, with an encircling oval of prismatic colours, was here very remarkable, and it increased in dimensions and vividness of colour till we entered a cloud at $6^h\ 29^m$; the increase of temperature, which had been in progress during the descent, was immediately checked, and on emerging from the cloud at $6^h\ 33^m$ the temperature was 43°, dew-point 38°. The earth was now in sight, without a ray of sunlight falling upon it. The temperature gradually increased to 56°, and dew-point to 50° at 1000 feet in height, and 62° on reaching the ground, as gently as on the preceding evening, at Dunton Lodge near Biggleswade, on the estate of Lord Brownlow, where we received every attention and assistance from his agent, Mr. Paulger.

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Ascent from the Crystal Palace, September 1.—The wind on this day blew from the E.N.E., the sky was almost covered with cirrostratus cloud, but the horizon was moderately clear. The ascent took place at $4^h\ 40^m$ P.M.; the temperature was 64°; the balloon rose to the height of half a mile in 4 minutes, the temperature decreasing to 51°, and dew-point to 43°; at this time the whole of the River Thames, from its mouth to beyond Richmond, was in sight. At $5^h\ 31^m$, when we were about 4000 feet high, clouds were observed forming and following the whole course of the Thames, from the Nore up to the higher parts, and extending but little beyond its sides; the clouds were parallel to the river, following all its windings and bendings. The Astronomer Royal has often seen this phenomenon over the part of the river commanded by the Royal Observatory, but it was scarcely expected that clouds throughout its whole course would have formed so simultaneously and uniformly. On referring to the state of the tide, it was found to be just high water at London Bridge about this time, connecting the formation with the warm water from the sea. After $5^h\ 40^m$ we were higher than all clouds near us, excepting the uniform stratus cloud above us, which we never approached; and it was noted that the upper surface of the lower clouds was bluish white, the middle portion the pure white of the cumulus, and the lowest a blackish white, and from which rain was falling, and, as we afterwards learned, had been falling all the afternoon. We descended to 1300 feet nearly, but were still above the clouds; we then rose to 3000 feet, and rain fell upon the balloon from the upper stratum of cloud, and no difference of temperature from 54° was observed in the stratum between 1300 feet and 3000 feet, although a short time before, in passing downwards through this distance, the temperature had increased from 48° to 54°. The falling rain equalized the temperature. The balloon began to descend after this, and fell at $6^h\ 15^m$ near Woking in Surrey. The evening looked so unpromising, and rain was still falling, that it was thought unadvisable to fasten the balloon for the night, and attempt a high morning ascent, as was contemplated. In this ascent the observations of the barometers and Daniell's hygrometer were made by Mr. J. MacDonald, Assistant Secretary to the British Meteorological Society.

Ascent from Wolverhampton, September 5.—This ascent had been delayed, owing to the unfavourable state of the weather. It commenced at $1^h\ 3^m$ P.M.; the temperature of the air was 59°, and the dew-point 50°; at the height of one mile it was 41°, dew-point 38°; and shortly afterwards we entered a cloud of about 1100 feet in thickness, in which the temperature of the air fell to $36\frac{1}{2}$°, the dew-point being the same, thus indicating that the air was here saturated with moisture. On emerging from the cloud at $1^h\ 17^m$, we came upon a flood of strong sunlight, with a beautiful blue sky, without a cloud above us, and a magnificent sea of cloud below, its surface being varied with endless hills, hillocks, mountain chains, and many snow-white masses rising from it. I here tried to take a view with the camera, but we were rising with too great rapidity, and going round and round too quickly to enable me to do so; the flood of light, however, was so great, that all I should have needed would have been a momentary exposure, as Dr. Hill Norris had kindly furnished me with extremely sensitive dry plates for the purpose. We reached two miles in height at $1^h\ 21^m$; the temperature had fallen to the freezing-point, and the dew-point to 26°. We were three miles high at $1^h\ 28^m$, with a temperature of 18°, and dew-point 13°; at $1^h\ 39^m$ we had reached four miles, and the temperature was 8°, and dew-point —15°; in ten minutes more we had reached the fifth mile, and the temperature had passed below zero, and then read

— 2°, and at this point no dew was observed on Regnault's hygrometer when cooled down to — 30°; but a dew-point obtained from the readings of dry and wet gave —36°. Up to this time I had taken observations with comfort. I had experienced no difficulty in breathing, whilst Mr. Coxwell, in consequence of the necessary exertions he had to make, had breathed with difficulty for some time. At $1^h\ 51^m$ the barometer reading was 11·05 inches, but which requires a subtractive correction of 0·25 inch, as found by comparison with Lord Wrottesley's standard barometer just before starting. I afterwards read the dry thermometer as —5°; this must have been about $1^h\ 52^m$ or later; I could not see the column of mercury in the wet-bulb thermometer; nor afterwards the hands of the watch, nor the fine divisions on any instrument. I asked Mr. Coxwell to help me to read the instruments, as I experienced a difficulty in seeing. In consequence, however, of the rotatory motion of the balloon, which had continued without ceasing since the earth had been left, the valve-line had become twisted, and he had to leave the car and mount into the ring above to adjust it. At this time I looked at the barometer, and found it to be 10 inches, still decreasing fast; its true reading therefore was 9¾ inches, implying a height of 29,000 feet. Shortly afterwards I laid my arm upon the table, possessed of its full vigour, and on being desirous of using it, I found it powerless—it must have lost its power momentarily. I tried to move the other arm, and found it powerless also. I then tried to shake myself, and succeeded in shaking my body. I seemed to have no limbs. I then looked at the barometer, and whilst doing so my head fell on my left shoulder. I struggled and shook my body again, but could not move my arms. I got my head upright, but for an instant only, when it fell on my right shoulder, and then I fell backwards, my back resting against the side of the car, and my head on its edge; in this position my eyes were directed towards Mr. Coxwell in the ring. When I shook my body I seemed to have full power over the muscles of the back, and considerable power over those of the neck, but none over either my arms or my legs; in fact I seemed to have none. As in the case of the arms, all muscular power was lost in an instant from my back and neck. I dimly saw Mr. Coxwell in the ring, and endeavoured to speak, but could not; when in an instant intense black darkness came, the optic nerve finally lost power suddenly. I was still conscious, with as active a brain as at the present moment whilst writing this. I thought I had been seized with asphyxia, and that I should experience no more, as death would come, unless we speedily descended: other thoughts were actively entering my mind, when I suddenly became unconscious as on going to sleep. I cannot tell anything of the sense of hearing; the perfect stillness and silence of the regions 6 miles from the earth (and at this time we were between 6 and 7 miles high) is such that no sound reaches the ear.

My last observation was made at $1^h\ 54^m$ at 29,000 feet. I suppose two or three minutes fully were occupied between my eyes becoming insensible to seeing fine divisions and $1^h\ 54^m$, and then that two or three minutes more passed till I was insensible, therefore I think this took place at about $1^h\ 56^m$ or $1^h\ 57^m$. Whilst powerless I heard the words "Temperature" and "Observation," and I knew Mr. Coxwell was in the car speaking to me, and endeavouring to arouse me, therefore consciousness and hearing had returned. I then heard him speak more emphatically, but I could not see, speak, or move. I heard him again say, "Do TRY—NOW DO." Then I saw the instruments dimly, then Mr. Coxwell, and very shortly saw clearly. I rose in my seat and looked round, as though waking from sleep, though not refreshed

by sleep, and said to Mr. Coxwell, "I have been insensible;" he said, "You have; and I, too, very nearly." I then drew up my legs, which had been extended before me, and took a pencil in my hand to begin observations. Mr. Coxwell told me that he had lost the use of his hands, which were black, and I poured brandy over them.

I resumed my observations at $2^h\ 7^m$, recording the barometer reading at 11·53 inches and temperature — 2°. I suppose that three or four minutes were occupied from the time of my hearing the words "temperature" and "observation" till I began to observe; if so, then returning consciousness came at $2^h\ 4^m$, and this gives seven minutes for total insensibility. I found the water in the vessel supplying the wet-bulb thermometer, which I had by frequent disturbances kept from freezing, was one solid mass of ice; and it did not all melt until after we had been on the ground some time.

Mr. Coxwell told me that whilst in the ring he felt it piercingly cold; that hoar-frost was all round the neck of the balloon; on attempting to leave the ring, he found his hands frozen, and he had to place his arms on the ring and drop down; that he thought for a moment I had laid back to rest myself; that he spoke to me without eliciting a reply; that he then noticed my legs projected and my arms hung down by my side; that my countenance was serene and placid, without the earnestness and anxiety he had noticed before going into the ring, and then it struck him I was insensible. He wished to approach me, but could not, and he felt insensibility coming over himself; that he became anxious to open the valve, but in consequence of having lost the use of his hands he could not, and ultimately did so by seizing the cord with his teeth and dipping his head two or three times until the balloon took a decided turn downwards. This act is quite characteristic of Mr. Coxwell. I have never yet seen him without a ready means of meeting every difficulty as it has arisen, with a cool self-possession that has always left my mind perfectly easy, and given me every confidence in his judgment in the management of so large a balloon.

No inconvenience followed this insensibility, and when we dropped it was in a country where no conveyance of any kind could be obtained, so that I had to walk between seven and eight miles.

The descent was at first very rapid; we passed downwards three miles in nine minutes; the balloon's career was then checked, and finally descended in the centre of a large grass field belonging to Mr. Kersall, at Cold Weston, seven and a half miles from Ludlow.

I have already said that my last observation was made at a height of 29,000 feet; at this time ($1^h\ 54^m$) we were ascending at the rate of 1000 feet per minute, and when I resumed observations we were descending at the rate of 2000 feet per minute; these two positions must be connected, taking into account the interval of time between, viz. 13 minutes, and on these considerations the balloon must have attained the altitude of 36,000 or 37,000 feet. Again, a very delicate minimum thermometer read —12°, and this would give a height of 37,000 feet; Mr. Coxwell on coming from the ring noticed that the centre of the aneroid barometer, its blue hand, and a rope attached to the car, were all in the same straight line, and this gave a reading of 7 inches, and leads to the same result. Therefore these independent means all lead to about the same elevation, viz. fully 7 miles.

In this ascent six pigeons were taken up. One was thrown out at the height of three miles, when it extended its wings and dropped as a piece of paper; a second, at four miles, flew vigorously round and round, apparently taking a dip each time; a third was thrown out between four and five miles,

and it fell downwards as a stone. A fourth was thrown out at four miles on descending; it flew in a circle, and shortly alighted on the top of the balloon. The two remaining pigeons were brought down to the ground. One was found to be dead; and the other, a "carrier," was still living, but would not leave the hand when I attempted to throw it off, till after a quarter of an hour it began to peck a piece of ribbon which encircled its neck, and was then jerked off the finger, and flew with some vigour towards Wolverhampton. One of the pigeons returned to Wolverhampton on Sunday the 7th, and is the only one that has been heard of.

Ascent from the Crystal Palace, September 8.—The sky was for the most part obscured by clouds; the ascent took place at $4^h\ 47^m\ 28^s$ P.M., the temperature on the ground being 67°; at $4^h\ 52^m$ we were half a mile high, with a temperature of 59°, and dew-point 54°; at $4^h\ 55^m$ we reached the clouds, with a temperature of $51\frac{1}{2}$°, dew-point 49°, at the height of 4300 feet; we rose to 4800 feet, were still in the cloud, and then fell, passing out of the cloud downwards at $5^h\ 1^m$, with a temperature of 49°, and dew-point 46°; we descended to 3300 feet by $5^h\ 7^m$, where the temperature was 52°, dew-point 50°; we then ascended and again reached the cloud at a little over 4200 feet, and with the same temperature as before, viz. $51\frac{1}{2}$°; we passed out of the cloud at a little over 4500 feet, into a basin, with blue sky above, and the sun shone beautifully; the balloon rose quickly, and the temperature increased from 51° on leaving the cloud to 57° at a mile in height, and to 59° and dew-point 40° at 5400 feet; we then descended, met with the cloud again at $5^h\ 25^m$, at the height of 5000 feet nearly, and experienced a temperature of 51°, dew-point 45°, whilst passing through it; we left the cloud at 4400 feet high, and the temperature rose from 51° to 61°, dew-point to 59°, at the height of 800 feet, and to 62° at the height of 700 feet, where we were at $5^h\ 55^m$; at this time we were crossing the River Thames near to Gravesend, and we passed from bank to bank in 121 seconds; we then rose to nearly half a mile, and passed Tilbury Fort at the distance of 2 miles, and with a telescope I examined the fort, and could have drawn its plan and counted any guns within it. We fell at about 4 miles from the Fort, at $6^h\ 10^m$ P.M.

In this ascent Mr. W. C. Nash, of the Magnetical and Meteorological Department of the Royal Observatory, Greenwich, took the observations of the barometer and Daniell's hygrometer.

§ 3. Description of the Table of Observations.

All the meteorological observations taken during the ascents are contained in Table I.

Column 1 contains the times at which the observations were made. Column 2 contains observations of the siphon barometer corrected for temperature and index error. Column 3 contains the readings of the thermometer attached to the barometer. Column 4 contains the readings of an aneroid barometer. Column 5 contains the height above the level of the sea, as deduced from the barometric observations in column 2, by the formula of Baily, checked at intervals by that of Laplace, which is as follows:—

$$Z=\log\left(\frac{h}{h'}\right)\times 60159\left(1+\frac{t+t'-64}{900}\right)\left(1+0\cdot002837\cos L\right)\left(1+\frac{2+52251}{20886900}\right),$$

where Z is the height required, and h, h', t and t' the height of the barometer corrected for temperature, and the temperature of the air at the lower and upper stations respectively, L the latitude. The temperature of the air for the position of the balloon has been derived from the readings in column 10. Columns 6 to 9 contain the observations with the dry- and wet-bulb thermometers free, and the deduced dew-point. Column 10 contains the readings of Negretti and Zambra's gridiron thermometer. Columns 11 to 14 contain the observations with the dry- and wet-bulb thermometers aspirated, and the deduced dew-point. Columns 15 and 16 contain the direct dew-point observations with Daniell's and Regnault's hygrometers. When numbers are entered in columns 15 and 16 with "no dew" affixed to them, it is meant that the temperature of the hygrometer has been lowered to the degree stated, but that no dew has been deposited.

Many observers in different parts of the country made observations at short intervals for several hours together, on several days of which notice had been given them that the ascent would take place, but, in consequence of the frequent delays owing to bad weather, their observations were not available, and it was found impossible to give notice with any certainty of the days of ascents.

A good many observers did, however, take a few observations in different parts of the country on the days of the several ascents. The Astronomer Royal at the Royal Observatory, Greenwich, had observations taken every 10 minutes on all the days of ascent, and Lord Wrottesley always arranged to have observations made at Wrottesley by Mr. Hough, on those days when the ascent took place from Wolverhampton. In calculating the height of the balloon, the observations of Wrottesley have been employed for July 17, August 18, and September 5; and those of the Royal Observatory, Greenwich, have been used for July 30, August 20, August 21, Sept. 1, and Sept. 8.

The height of Greenwich above the mean sea-level=159 feet.

The height of Wrottesley above the mean sea-level=531 feet.

Y30.A

Table I.—Meteorological Observations made in Eight Balloon Ascents. Wolverhampton, July 17, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32°Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	9 42 0 a.m.	29·193	50·0	......	490	59·0	55·0	4·0	51·4							
	9 47 0 „	26·014	44·0	......	3,835	45·0	40·5	4·5	35·3							
(2)	9 49 0 „	25·215	44·0	25·32	4,467	43·0	38·0	5·0	32·0	43·0						
(3)	9 51 0 „	24·138	43·5	24·30	5,802	35·8	34·2	1·6	33·8	34·8	......	......	......	......	30·5	
(4)	9 53 0 „	22·421	43·0	22·65	7,980	......	......	......	......	32·5						
	9 54 0 „	22·023	42·0	22·20	8,065	32·5	32·0	0·5	27·8							
(5)	9 55 0 „	21·575	41·0	21·80	8,809	30·2	27·7	2·5	19·7	29·8	......	......	......	......	......	24·0
	9 56 0 „	20·927	40·5	21·10	9,598	28·2	26·1	2·1	17·6	26·2						
	9 58 0 „	19·629	40·0	20·09	11,312	......	......	......	......	26·0	......	......	......	......	24·5	
(6)	10 2 0 „	19·281	39·5	19·60	11,792	28·2	27·1	1·1	23·9	26·0	......	......	......	......	......	25·0
(7)	10 3 0 „	18·633	39·2	18·90	12,709	......	......	......	......	26·0	......	......	......	......	19·5	21·0
(8)	10 4 0 „	......	......	......	......	27·2	25·1	2·1	16·9	26·2	......	......	......	......	21·0	22·0
(9)	10 5 0 „	18·136	37·0	18·40	13,467	29·0	28·1	0·9	24·9	......	......	......	......	......	......	22·5
(10)	10 8 0 „	17·235	38·2	17·52	14,544	33·0	30·0	3·0	24·0	31·0	32·0	30·4	1·6	26·7	20·5	24·0
(11)	10 11 0 „	16·735	38·5	17·10	15,704	33·0	30·2	2·8	24·6	31·6	32·0	29·2	0·8	22·7	22·0	21·5
(12)	10 15 0 „	16·036	38·0	16·25	16,914	33·0	30·1	2·9	24·3	32·0	31·0	28·0	3·0	19·8	23·0	20·8
(13)	10 25 0 „	14·937	38·0	15·15	18,844	35·0	31·5	3·5	24·9	37·2	35·0	31·2	3·8	24·4	25·1	24·2
(14)	10 27 0 „	14·637	38·0	15·30	19,374	34·2	31·1	3·1	25·6	36·1	36·5	31·2	5·3	23·2	22·6	21·0
(15)	10 29 0 „	14·637	38·0	15·30	19,415	37·5	30·0	7·5	19·5	38·2	37·0	30·5	6·5	21·4	......	22·2
(16)	10 30 0 „	14·637	38·0	15·30	19,415	38·1	31·2	6·9	21·8	38·1	37·5	29·5	8·0	18·3	21·5	22·2
(17)	10 35 0 „	14·637	40·0	15·00	19,435	43·0	31·0	12·0	16·6	42·2	......	......	......	......	19·0	20·0
(18)	10 39 0 „	14·634	40·0	......	19,380	37·0	31·5	5·5	23·8	36·5	34·5	......	......	......	20·0	21·1
(19)	10 44 0 „	14·633	40·0	15·10	19,336	36·2	30·5	5·7	22·1	34·0	36·2	30·5	5·7	22·1	20·5	20·5
(20)	10 47 0 „	14·134	40·0	14·70	20,238	32·0	26·5	5·5	13·8	31·5	30·8	26·0	4·8	13·2	16·0	15·5
	10 48 0 „	......	......	......	......	......	......	......	......	31·0						
(21)	10 50 0 „	13·637	39·0	14·20	21,059	24·5	17·2	7·3	−26·6	......	23·0	17·0	6·0	−20·6	−12·0	−13·0
(22)	10 54 0 „	13·137	39·0	13·60	21,792	19·2	11·2	8·0	−47·5	......	......	......	......	......	− 8·2	
(23)	10 57 0 „	12·139	38·0	12·60	23,949	16·5	9·5	7·0	−44·1	17·5	18·5	8·0	10·5	−69·9	......	− 9·0
(24)	11 0 0 „	11·741	37·0	......	24,746	......	......	......	......	16·0	......	......	......	......	......	− 8·0
(25)	11 1 0 „	11·143	36·0	......	26,177	......	......	......	......	16·0	......	......	......	......	− 9·0	
(26)	11 3 0 „	11·642	35·0	12·10	25,022	......	......	......	......	16·0	......	......	......	......	......	− 8·5
	11 5 0 „	11·644	34·0	......	25,028											
	11 7 0 „	11·645	33·0	12·10	25,077	19·0	9·0	10·0	−67·4	......	18·2	12·0	6·2	−34·5		
(27)	11 12 0 „	11·945	33·0	12·40	24,547	......	......	......	......	23·7						
(28)	11 20 0 „	12·645	33·0	13·20	23,868	26·1	19·2	6·9	−25·8	27·0						
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

Notes and General Remarks.

(1) $9^h\ 42^m$, turned tap for water to run; $9^h\ 43^m$, balloon left the earth; $9^h\ 44^m$, dropped gutta-percha tubes below the car. (2) Clouds reached.

(3) Clouds at a lower elevation all round. (4) In a cloud, cumulostratus; dry; fog.

(5) Sun shining on the balloon; valve opened; beautiful view.

(6) Clouds beautiful; balloon full. (7) Band of music heard.

(8) Earth visible. (9) Electrometer, balloon reading 59°; air reading 64°.

(10) Electrometer, balloon reading 59°; air reading 63°.

(11) Electrometer, balloon reading 59°; air reading 63°.

(12) Gas cleared in balloon from appearance of smoke to transparency; intense prussian blue sky; cumuli clouds far below; strati same height; no clouds above.

(13) Eighteen vibrations of horizontal magnet occupied $26^s{\cdot}8$. Mr. Coxwell's pulse 84; Mr. Glaisher's 100; Mr. Coxwell's 86. (14) Wind S.W.; moving N.E.

(15) Palpitation of heart perceptible in both of us; clock beat very loud; breathing affected. (16) Ozone 0. Tried to take vibrations.

(17) Electrometer, balloon reading 58°; air reading 61°. Palpitation of heart very perceptible.

(18) Deep blue sky; dark bluish hands and lips, not face.

(19) Sand out. Electrometer, balloon reading 58°; air reading 60°·2. Heart less affected; moving northwards.

(20) Twenty-eight vibrations of horizontal magnet occupied 43^s.

(21) Electrometer, balloon reading 59°; air reading 58°. Breathing affected.

(22) No dew at −8°·2. Electrometer, balloon reading 58°; air reading 59°. Very deep blue sky; clouds far below; cold, but not intense. (23) No dew. All the feelings of sea-sickness.

(24) Ozone 0. Feeling of illness. Mr. Coxwell says a disagreeable sensation came over him; cannot tell how. (25) No dew at this temperature.

(26) No dew. Through a feeling of illness, I was unable to keep to the instruments long enough to lower the temperature to get a deposit of dew.

(27) Electrometer, balloon reading 58°; air reading 58°. (28) Ozone 0; the air is very dry.

TABLE I.—Meteorological Observations made in Eight Balloon Ascents. Wolverhampton, July 17, 1862.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers. Daniell's.	Hygrometers. Regnault's.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Dew-point.	Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	11 25 0 a.m.	13·144	......	13·60	22,357	28·1	17·5	10·6	−26·1	27·2	......	16·2				
(2)	11 37 0 „	16·359	33·0	......	16,282	29·7	24·8	4·9	+ 9·4							
(3)	11 38 0 „	18·944	......	19·00	12,376	34·2	28·1	6·1	7·4							
(4)	11 39 0 „	20·042	......	20·40	10,539	37·0	?									
(5)	11 40 0 „	20·542	......	20·80	9,882	37·8	30·2	7·6	19·9	......	37·8	30·1	7·7	19·7		
(6)	11 42 0 „															
(7)	11 44 0 „	23·442	......	......	6,330											
(8)	11 45 0 „	24·242	......	......	5,432											
	Crystal Palace, July 30, 1862.															
(9)	4 36 0 p.m.	......	......	29·96	250	68·2	58·0	10·2	50·0	......	......	......	......	......	50·0	
(10)	4 40 0 „	......	......	29·96	250	68·0	57·8	10·2	49·7							
(11)	4 40 30 „	......	......	29·87	330	67·2	56·5	10·7	48·0							
	4 40 45 „	......	......	29·82	370	66·5	56·2	10·3	47·9							
	4 41 0 „	......	......	29·80	390	66·5	56·2	10·3	47·9							
(12)	4 41 15 „	......	......	29·65	480	66·0	56·0	10·0	47·9							
	4 41 30 „	......	......	29·55	570	65·5	55·5	10·0	47·3							
	4 42 0 „	......	......	29·50	615	65·2	54·1	11·1	45·1							
	4 42 30 „	......	......	29·20	890	63·8	53·5	10·3	44·9	......	......	......	......	......	44·0	
	4 43 0 „	......	......	28·85	1,189	62·0	51·9	10·1	43·2							
	4 43 30 „	......	......	28·65	1,389	62·0	51·8	10·2	43·0							
	4 44 30 „	......	......	28·20	1,829	59·8	51·1	8·7	43·5							
(13)	4 45 30 „	......	......	27·65	2,379	58·5	50·1	8·4	42·6	......	......	......	......	......	38·5	
	4 47 30 „	......	......	27·10	2,452	54·2	48·0	6·2	41·9							
	4 48 30 „	......	......	26·87	3,161	52·5	47·0	5·5	41·4							
	4 49 0 „	......	......	26·50	3,540	51·0	45·5	5·5	39·8							
	4 50 0 „	......	......	26·40	3,640	50·4	45·5	4·9	40·4							
	4 50 30 „	......	......	26·35	3,690	49·8	45·5	4·3	41·0	......	......	......	......	......	36·3	
	4 52 0 „	......	......	26·27	3,770	50·0	45·0	5·0	39·7	......	......	......	......	......	40·5	
	4 52 30 „	......	......	26·25	3,790	50·6	45·7	4·9	40·7	......	......	......	......	......	41·5	
	4 53 30 „	......	......	26·18	3,860	51·0	45·6	5·4	40·0							
	4 54 0 „	......	......	26·12	3,920	52·2	46·0	6·2	39·7							
	4 54 30 „	......	......	26·08	3,960	52·5	46·0	6·5	39·4							
(14)	4 56 0 „	......	......	25·91	4,169	51·5	46·0	5·5	40·3	......	......	......	......	......	41·5	
	4 56 45 „	......	......	25·80	4,279	50·0	45·0	5·0	39·7	......	......	......	......	......	41·2	
	4 57 30 „	......	......	25·73	4,358	50·5	45·0	5·5	39·2							
	4 59 0 „	......	......	25·78	4,308	50·5	45·0	5·5	39·2							
	4 59 30 „	......	......	25·85	4,234	51·5	46·0	5·5	40·3							
	5 0 0 „	......	......	25·90	4,184	51·8	46·0	5·8	40·1							
	5 0 30 „	......	......	26·90	4,084	51·8	46·0	5·8	40·1							
(15)	5 1 0 „	......	......	......	(4,094)	51·5	45·8	5·7	39·9							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Could not get the magnet to vibrate; ozone 0.
(2) Tried for some time to get vibrations; arcs of 20°; settled immediately; ozone 0 (ill again).
(3) Image of balloon and car on cloud very large and distinct.
(4) Sand out.
(5) Passing through cloud; could not see the balloon.
(6) Fog; dry.
(7) Sand out; balloon forming a parachute.
(8) Clouds of a dense character were rising apparently with great rapidity. The balloon was descending very quickly; I hurriedly put up as many instruments as I could. Mr. Coxwell discharged quickly several bags of ballast; let go the grapnel, and called out to me to take hold, when the car struck the earth with great violence, which broke several instruments; then bounded and descended again, and finally the balloon-netting caught in a large tree at 11h 50m, at Langham, near Oakham.
(9) Thirteen in car. Raised a little for photograph.
(10) Left at 4h 40m 10s.
(11) Sand out.
(12) Wind S.W.
(13) Gas cloudy.
(14) Thin fog; horizon hidden; hazy.
(15) Sand out.

Table I.—Meteorological Observations made in Eight Balloon Ascents. Crystal Palace, July 30, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Dry and Wet Thermometers (aspirated). Wet.	Dry and Wet Thermometers (aspirated). Diff.	Dry and Wet Thermometers (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	5 1 30 p.m.	......	......	25·98	4,104	52·1	46·2	5·9	40·2	......	......	......	......	......	43·1	
	5 3 0 ,,	......	......	25·76	4,324	51·5	46·2	5·3	40·7	......	......	......	......	......	43·1	
(2)	5 4 30 ,,	......	......	25·68	4,403	52·1	46·0	6·1	39·8	......	......	......	......	......	41·0	
	5 7 30 ,,	......	......	25·47	4,613	49·2	43·1	6·2	36·5	......	......	......	......	......	40·5	
	5 8 0 ,,	......	......	25·30	4,783	49·0	43·1	5·9	36·7							
(3)	5 9 30 ,,	......	......	25·40	4,683	48·5	43·5	5·0	38·1	......	......	......	......	......	39·5	
	5 10 0 ,,	......	......	25·35	4,733	48·9	43·5	5·4	37·7							
(4)	5 11 30 ,,	......	......	25·20	4,923	48·2	43·1	5·1	37·5							
	5 12 0 ,,	......	......	25·20	4,923	48·5	43·1	5·4	37·2							
	5 14 0 ,,	......	......	25·26	4,863	48·2	43·0	5·2	37·3	......	......	......	......	......	39·5	
	5 16 0 ,,	......	......	25·25	4,873	48·2	43·3	4·9	38·0	......	......	......	......	......	39·0	
(5)	5 16 30 ,,	......	......	25·20	4,923	47·9	43·0	4·9	37·6	......	......	......	......	......	39·5	
(6)	5 17 30 ,,	......	......	25·00	5,155	49·5	43·1	6·4	36·2							
	5 18 0 ,,	......	......	24·93	5,220	49·3	43·5	5·8	37·3	......	......	......	......	......	39·0	
	5 20 30 ,,	......	......	24·78	5,370	48·2	43·0	5·2	37·3							
	5 21 0 ,,	......	......	24·79	5,360	48·5	43·1	5·4	37·2	......	......	......	......	......	40·5	
	5 22 0 ,,	......	......	24·95	5,200	49·8	44·5	5·3	38·9	......	......	......	......	......	40·0	
	5 23 30 ,,	......	......	24·95	5,200	48·5	43·1	5·4	37·2	......	......	......	......	......	42·0	
	5 24 0 ,,	......	......	24·82	5,330	50·0	44·5	5·5	38·7	......	......	......	......	......	40·2	
(7)	5 24 30 ,,	......	......	24·70	5,450	47·5	42·0	5·5	35·9	......	......	......	......	......	38·0	
(8)	5 26 0 ,,	......	......	24·62	5,830	47·8	42·1	5·7	35·8	......	......	......	......	......	38·2	
	5 28 30 ,,	......	......	24·32	5,530	48·0	42·0	6·0	35·4	......	......	......	......	......	36·2	
(9)	5 31 0 ,,	......	......	24·47	5,380	48·5	42·6	5·9	36·2							
(10)	5 31 30 ,,	......	......	24·57	5,280	48·2	43·5	4·7	38·4	......	......	......	......	......	36·5	
(11)	5 38 30 ,,	......	......	24·30	5,903	43·5	40·0	3·5	35·8							
(12)	5 39 0 ,,	......	......	24·22	5,983	43·5	40·0	3·5	35·8	......	......	......	......	......	38·0	
(13)	5 40 30 ,,	......	......	24·02	6,183	43·5	40·0	3·5	35·8							
	5 41 0 ,,	......	......	......	(6,220)	44·1	39·5	4·6	34·0	......	......	......	......	......	36·0	
	5 43 0 ,,	......	......	23·83	6,370	44·2	38·9	6·3	32·7	......	......	......	......	......	34·0	
(14)	5 44 0 ,,	......	......	24·00	6,252	45·2	40·5	4·7	35·1							
	5 45 30 ,,	......	......	24·42	5,785	46·5	41·5	5·0	35·9							
(15)	5 47 0 ,,	......	......	24·60	5,577	46·0	41·5	4·5	36·4	......	......	......	......	......	36·0	
	5 48 0 ,,	......	......	24·53	5,649	45·2	40·5	4·7	35·1							
	5 50 0 ,,	......	......	24·35	5,846	44·2	39·8	4·4	34·7	......	......	......	......	......	35·5	
(16)	5 52 0 ,,	......	......	24·12	6,102	43·0	38·5	4·5	33·1	......	......	......	......	......	36·0	
(17)	5 54 0 ,,	......	......	23·82	6,466	46·0	40·5	5·5	34·3							
	5 55 0 ,,	......	......	23·69	6,642	46·5	40·5	6·0	33·8							
	5 57 0 ,,	......	......	23·58	6,752	47·2	41·5	5·7	35·2							
	5 57 30 ,,	......	......	23·50	6,826	43·5	38·0	5·5	31·4							
	5 58 0 ,,	......	......	23·47	6,856	43·1	37·9	5·2	32·6							
	5 58 30 ,,	......	......	23·43	6,896	43·5	38·0	5·5	31·4							
	5 59 0 ,,	......	......	......	(6,910)	43·0	37·0	6·0	29·8							
	6 0 0 ,,	......	......	23·40	6,937	42·5	37·0	5·5	30·3	......	......	......	......	......	32·0	
	6 1 0 ,,	......	......	23·47	6,867	41·0	37·0	4·0	32·0	......	......	......	......	......	31·5	
(18)	6 2 0 ,,	......	......	23·79	6,547	41·5	37·0	4·5	31·4	......	......	......	......	......	32·0	
(19)	6 6 0 ,,	......	......	......	(6,603)	45·6	39·1	6·5	31·6							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Balloon spirating.
(2) Between these two intervals tried to get magnet to vibrate, but could not do so.
(3) Misty and thick to leeward; fine to windward.
(4) Twenty vibrations of horizontal magnet in $32^{s}\cdot5$. Needle kept in same relative position to the car. (5) Sand out. (6) Wind W.N.W.
(7) Gun heard with a sharp sound; drum beating; band heard.
(8) Cumuli all round at lower elevation. (9) Gas partially clear.

(10) Deep blue sky, dotted with cumuli; sun shining brightly.
(11) Misty; cloudy particles moving; gun heard.
(12) Balloon spirating. (13) Wind N.
(14) Sun shining on cases of Dry and Wet Bulb Thermometers; readings not affected thereby.
(15) Cloudy particles seen moving. (16) Sun shining on Daniell's Hygrometer. (17) Great mist.
(18) Deep blue sky, dotted with cirrocumuli, cumuli, and cumulostratus below.
(19) Ozone 0; steamboat seen near Dartford.

TABLE I.—Meteorological Observations made in Eight Balloon Ascents. Crystal Palace, July 30, 1862.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	6 7 0 p.m.	......	......	......	(6,617)	45·2	39·5	5·7	32·9							
(2)	6 7 30 „	......	......	......	(6,625)	45·0	39·2	5·8	32·4							
	6 8 30 „	......	......	23·70	6,637	45·0	38·6	6·4	31·3							
	6 10 30 „	......	......	23·59	6,747	44·8	37·5	7·3	29·0							
	6 11 30 „	......	......	23·40	6,937	44·2	38·5	5·7	31·8	......	......	......	......	......	32·0	
(3)	6 13 0 „	......	......	23·42	6,917	44·2	38·5	5·7	31·8	......	......	......	......	......	32·0	
	6 14 0 „	......	......	......	......	44·5	38·2	6·3	30·8	......	......	......	......	......	31·8	
	6 15 0 „	......	......	23·63	6,720	44·5	38·9	5·6	32·4							
	6 17 0 „	......	......	......	......	45·5	39·0	6·5	32·5							
	6 18 0 „	......	......	23·95	6,400	45·2	38·9	6·3	32·7	......	......	......	......	......	31·0	
	6 18 30 „	......	......	24·35	6,000	46·4	40·0	6·4	32·8	......	......	......	......	......	32·0	
	6 19 0 „	......	......	24·55	5,800	46·0	40·5	5·5	34·3							
	6 19 30 „	......	......	24·60	5,750	46·2	41·5	4·7	36·2							
(4)	6 20 0 „	......	......	24·95	5,400	47·0	41·5	5·5	35·4							
	6 21 0 „	......	......	25·40	4,950	47·5	42·5	5·0	37·0	......	......	......	......	......	39·0	
	6 22 0 „	......	......	25·90	4,450	47·8	43·5	4·3	38·8	......	......	......	......	......	40·0	
	6 22 30 „	......	......	......	......	49·0	44·0	5·0	38·6							
(5)	6 23 0 „	......	......	26·48	3,870	49·2	44·5	4·7	39·5							
	6 24 0 „	......	......	26·60	3,750	50·1	46·0	4·1	41·7							
	6 25 0 „	......	......	27·65	2,700	55·5	48·7	7·8	42·2	......	......	......	......	......	42·5	
	6 25 30 „	......	......	......	......	58·3	49·5	9·8	41·7							
(6)	6 30 0 „	......	......	29·96	on the ground	68·0	56·5	11·5	47·4							
	Wolverhampton, August 18, 1862.															
(7)	0 53 0 p.m.	29·342	69·0	......	490	......	......	......	......	......	65·0	57·5	7·5	51·4		
(8)	0 56 0 „	29·342	69·0	29·51	490	66·2	60·0	6·2	55·0	67·8	68·0	60·5	7·5	54·6	55·0	53·9
(9)	1 5 0 „	28·842	......	......	1,130	62·5	57·1	5·4	52·5							
	1 6 0 „	28·546	......	28·78	1,419	......	......	......	......	60·0						
	1 6 20 „	28·247	......	......	1,713	58·2	55·5	2·7	53·1							
	1 6 30 „	......	......	......	......	......	......	......	......	57·2						
	1 7 0 „	27·898	......	......	2,042	55·1	53·8	1·3	52·5	......	56·0	53·2	2·4	50·6	......	48·5
(10)	1 8 0 „	26·665	64·5	26·90	3,347											
(11)	1 8 20 „	......	......	......	......	......	......	......	......	52·5						
(12)	1 9 0 „	26·271	......	......	3,705	50·0	49·8	0·2	49·6							
	1 10 0 „	25·862	62·0	26·08	4,138	......	......	......	......	49·9						
	1 10 25 „	......	......	......	......	49·8	47·1	2·7	44·2							
	1 11 0 „	25·300	61·0	......	4,767	48·8	45·6	3·2	42·2							
(13)	1 11 30 „	......	......	25·15	(5,140)	......	......	......	......	48·6						
	1 12 0 „	24·600	59·5	......	5,509	......	......	......	......	48·2						
	1 12 30 „	24·602	......	......	5,510	47·8	43·5	4·3	38·8							
	1 13 20 „	......	......	......	......	......	......	......	......	......	48·0	44·1	3·9	39·8	37·0	36·2
(14)	1 14 0 „	23·635	59·0	23·82	6,585	......	......	......	......	46·5						
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Cumulostratus and cumulus same height; strati above.
(2) Ozone o, by Moffat and Schönbein. (3) Going down Long Reach. (4) Gravesen
(5) Removed instruments; hop-garden under us; came down in potato-field.
(6) In this ascent the instruments were carried by a board fixed to the side of the car the balloon, I standing all the time and looking over the side of the car; Mr. Ingelow w seated on my left hand and read the Aneroid Barometer and Daniell's Hygrometer; my s was on my right hand.

(7) In car of balloon before starting. (8) In car of balloon.
(9) Wind N.N.E.; left the earth at $1^h\ 2^m\ 38^s$.
(10) In cumulus cloud.
(11) Lost sight of earth.
(12) Sun glorious and beautiful indeed; deep blue sky.
(13) Over railway; exceedingly beautiful.
(14) Going towards Birmingham; over Black Country.

TABLE I.—Meteorological Observations made in Eight Balloon Ascents. Wolverhampton, August 18, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	1 15 0 p.m.	22·687	59·0	22·68	7,706	......	......	......	......	45·7						
(2)	1 17 0 „	21·694	57·0	......	8,935	44·0	38·5	5·5	32·0							
(3)	1 18 45 „	20·895	57·0	......	9,954	43·5	37·0	6·5	29·2	43·0	......	......	......	......	30·±	
(4)	1 18 55 „	......	......	20·89	......	41·0	35·5	5·5	28·6	40·5						
	1 20 0 „	19·897	......	20·05	11,267	......	......	......	......	38·5						
(5)	1 20 5 „	......	......	......	......	37·2	32·1	5·1	24·9							
	1 20 35 „	19·797	......	......	11,399	36·0	31·5	4·5	24·8							
(6)	1 21 0 „	19·749	......	......	11,470	39·5	32·0	7·5	22·2							
(7)	1 22 0 „	20·297	......	......	10,840	42·0	36·0	6·0	28·6	41·8	......	......	......	......	22·0	25·0
(8)	1 24 0 „	20·897	......	......	9,884	45·0	38·0	7·0	29·9	......	......	......	......	......	24·0	
	1 24 5 „	......	......	......	......	......	......	......	......	45·0						
	1 24 15 „	20·897	......	21·28	9,884											
	1 24 50 „	21·377	......	......	......	46·2	39·5	6·7	32·0							
(9)	1 25 0 „	......	......	21·80	......	......	......	......	......	45·8						
	1 25 10 „	......	......	......	......	47·2	40·5	6·7	33·1							
	1 26 0 „															
	1 26 30 „	22·212	......	......	8,342	......	......	......	......	......	......	......	......	......	......	30·5
(10)	1 27 0 „	22·622	52·0	22·90	7,836	51·0	46·5	5·5	41·8	51·0	......	......	......	......	......	34·0
	1 32 0 „	22·802	......	22·85	7,650	51·2	46·0	5·2	40·6	49·2	......	......	......	......	35·5	35·0
(11)	1 33 0 „	22·802	......	......	7,650	53·8	47·8	6·0	42·0	......	......	......	......	......	......	36·6
(12)	1 34 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	36·0
(13)	....	......	......	......	......	......	......	......	......	......	......	......	......	......	......	39·0
(14)	1 37 30 „	24·248	59·0	......	5,919	56·8	50·5	6·3	44·8							
(15)	1 38 0 „	24·460	59·0	24·60	5,820	57·0	50·5	6·5	44·6	53·8	......	......	......	......	......	37·5
	1 39 0 „															
	1 40 0 „	......	......	......	......	58·0	51·5	6·5	45·7							
	1 41 0 „	25·083	62·0	25·30	5,028	58·9	52·0	6·9	45·9	53·5						
(16)	1 41 30 „	25·564	65·0	......	4,530	......	......	......	......	......	......	......	......	......	......	43·5
	1 42 0 „	......	......	25·60												
(17)	1 43 0 „	25·584	......	......	4,480	60·0	53·5	6·5	47·8	......	......	......	......	......	46·0	
	....	......	......	......	......	60·9	53·5	7·4	47·1							
(18)	1 46 0 „	26·561	......	......	3,438	61·0	53·5	7·5	47·0	......	......	......	......	......	47·8	47·2
(19)	1 48 0 „	26·756	67·0	......	3,219	59·0	54·0	5·0	49·6	56·0						
	1 52 0 „	25·795	......	25·82	4,233	53·5	49·2	4·3	45·0	55·0						
(20)	1 52 30 „	25·594	65·0	......	4,448											
	1 53 0 „	......	......	......	......	52·2	48·5	3·7	44·7	......	......	......	......	......	......	40·0
	1 55 0 „	25·079	65·0	25·25	5,019	51·0	47·8	3·2	44·5	......	......	......	......	......	42·0	
(21)	1 56 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	39·5
(22)	1 57 40 „	......	......	......	......	......	......	......	......	......	50·0	46·5	3·5	42·8	......	39·0
	1 58 0 „	24·394	62·5	......	5,780											
	1 58 30 „	......	......	24·52	......	......	......	......	......	54·8						
(23)	1 58 40 „	......	......	......	......	......	......	......	......	......	52·2	46·8	5·4	41·3	......	39·0
	2 0 0 „	23·928	62·0	24·10	6,313											
	2 1 0 „	23·778	62·0	......	6,491											
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Birmingham in view? (2) Wind N.W.; moving S.E.; gorgeous view. (3) Light and shade magnificent. (4) Balloon full; gas cloudy. (5) Turned to descend. (6) Opened valve.

(7) Most glorious view possible; cumuli far below, detached. Wolverhampton under us, as a fine model.

(8) Plains of clouds in the distance. (9) Opened valve.

(10) Rippling of edges of canal beautiful; calm; Black Country remarkable; alpine and dome-like clouds; bright on one side, dull on the other; detached cumuli; horizon apparently same height as the eye.

(11) The sun shining on shades of Dry and Wet Bulb; valve opened; beautiful resonant sound.

(12) Aspirator difficult to work. (13) Clouds very beautiful. (14) Warm to sense.

(15) About midway between Wolverhampton and large town, ? Walsall.

(16) Balloon collapsed. (17) Shouting below, thinking we are descending; a reservoir in sight.

(18) Shaded the instruments.

(19) Protected the Dry Bulb from influence of sun; sand out; shouting.

(20) Beautiful prismatic colours round the balloon's shadow; passing along high road to Birmingham.

(21) Bell heard in Birmingham very distinctly.

(22) Sand out.

(23) Cumuli same height as car.

Table I.—Meteorological Observations made in Eight Balloon Ascents. Wolverhampton, August 18, 1862.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	2 1 30 p.m.	......	......	23·90	......	......	......	......	......	54·0	55·0	48·2	6·8	41·7		
(2)	2 9 0 ,,	22·584	61·0	22·71	7,886	53·5	46·0	7·5	38·6	50·5						
(3)	2 10 0 ,,	......	......	......	......	......	......	......	......	......	48·5	44·0	4·5	39·1	......	36·0
	2 10 30 ,,	22·182	62·1	......	8,571	51·0	45·5	5·5	39·8							
	2 11 0 ,,	......	......	22·32	......	51·0	44·8	6·2	38·4							
	2 11 40 ,,	21·882	62·0	......	8,771	......	......	......	......	......	51·0	44·0	7·0	36·7	......	38·5
	2 11 50 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	39·0	
	2 12 0 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	......	39·0
	2 12 20 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	39·5	
	2 13 0 ,,	21·882	62·1	......	8,771											
	2 13 40 ,,	......	......	21·95	......	......	......	......	......	50·5						
(4)	2 13 50 ,,	......	......	......	......	53·2	44·5	8·7	34·9							
	2 14 0 ,,	20·989	......	......	9,902	......	......	......	......	50·0						
(5)	2 15 0 ,,	21·139	60·0	......	9,695	50·5	42·5	8·0	34·1							
	2 15 30 ,,	......	......	......	......	......	......	......	......	48·1						
(6)	2 17 0 ,,	20·239	61·5	20·50	10,864	45·5	37·1	8·4	27·4	......	42·1	37·1	5·0	31·0	......	29·5
	2 20 0 ,,	19·599	......	......	11,748	45·5	34·2	11·3	21·2							
(7)	2 21 0 ,,	19·109	52·0	19·30	(12,364)	44·0	34·0	10·0	22·2	39·2	39·5	32·0	7·5	22·2	......	29·0
(8)	2 22 0 ,,	19·310	......	19·21	......	44·0	33·8	10·2	21·8	38·5						
(9)	2 22 30 ,,	18·859	52·5	......	12,708											
	2 23 0 ,,	18·708	53·0	......	12,942	44·0	32·0	12·0	17·9	38·0						
(10)	2 24 0 ,,	18·109	53·0	......	13,852	39·0	31·5	7·5	21·6	34·1						
	2 25 0 ,,	......	......	......	......	......	......	......	......	......	39·5	32·5	7·0	23·4		
(11)	2 25 20 ,,	17·614	......	17·85	14,434	......	......	......	......	......	......	......	......	......	......	23·1
(12)	2 29 0 ,,	16·410	48·0	16·50	16,339	37·5	27·2	10·3	12·9	27·8						
(13)	2 31 0 ,,	......	......	......	......	......	......	......	......	......	36·5	21·5	15·0	− 0·7	......	6·0
(14)	2 32 0 ,,	15·926	......	......	17,157	39·5	31·5	8·0	21·1							
(15)	2 32 10 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	......	5·0
	2 32 20 ,,	15·844	45·5	16·00	17,321	......	......	......	......	28·1						
	2 32 30 ,,	......	......	......	......	37·1	29·5	7·6	18·8	......	35·0	21·0	14·0	− 1·4	[no dew.	
	2 34 0 ,,	......	......	......	......	......	......	......	......	30·5	......	......	......	......	5·0	
(16)	2 34 20 ,,	......	......	......	......	35·5	31·0	4·5	24·0	......	......	......	......	......	......	3·5
	2 35 0 ,,	15·600	......	15·50	18,039	......	......	......	......	......	31·5	21·0	10·5	− 5·4	......	3·0
	2 36 0 ,,	......	......	......	......	37·5	31·5	6·0	23·2							
	2 36 10 ,,	......	......	......	......	......	......	......	......	27·5	30·0	20·0	10·0	−11·5	......	0·0
	2 36 20 ,,	......	......	......	......	......	......	......	......	28·0						
	2 36 30 ,,	15·026	47·5	......	18,560											
	2 36 40 ,,	......	......	15·02	......	......	......	......	......	24·8	......	......	......	......	......	−2·0
	2 36 50 ,,	......	......	......	......	......	......	......	......	25·5						
	2 37 50 ,,	......	......	......	......	36·1	31·5	4·6	24·6							
(17)	2 38 10 ,,	14·868	52·5	......	19,000											
	2 38 30 ,,	......	......	14·92	19,230	......	......	......	......	......	......	......	......	......	......	−5·0
	2 38 40 ,,	......	......	......	......	......	......	......	......	28·5						
	2 38 50 ,,	......	......	......	......	39·0	31·2	7·8	21·0							
(18)	2 39 0 ,,	14·617	......	......	19,461	[sun shining.										
	2 39 10 ,,	14·820	......	14·72	19,604											
	2 39 20 ,,	......	......	......	......	......	......	......	......	26·1						
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Ozone 8; sand out. (2) Rippling of water on edges of canal very distinct. (3) Near Lichfield. (4) Ozone: Moffat 2=1; Sch. =1; Moffat 1=8. (5) Sand out. (6) Beautiful appearance still. (7) Very extended view. (8) Balloon full and clear. (9) Great mass of cloud to the E. (10) Large town to the right. (11) Sea of clouds, very deep blue sky; snow-white appearances; balloon transparent: a few clouds below; cirrus still higher; gas getting foggy; cirrus still above at great height. (12) Sun shining on cases of Dry and Wet Bulb Thermometers. (13) Ozone 1=10. (14) Ozone 2=6 (15) Ozone 3=7. (16) Clap of thunder; no cloud in sight. (17) Aspirator troublesome to work. (18) Sun shining on cases of Dry and Wet Bulb Thermometers; could not screen it; tried umbrella; failed.

Table I.—Meteorological Observations made in Eight Balloon Ascents. Wolverhampton, August 18, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Dry and Wet Thermometers (aspirated). Wet.	Dry and Wet Thermometers (aspirated). Diff.	Dry and Wet Thermometers (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	2 39 30 p.m.	14·600	......	14·50	20,000	......	......	......	......	25·5						
	2 42 0 ,,	......	......	......	......	......	21·8	......	......	......	......	......	......	......	......	− 8·5
	2 42 10 ,,	14·118	......	......	20,359	......	......	......	......	25·1						
(1)	2 45 0 ,,	......	......	......	......	......	......	......	......	......	19·0	21·0	......	......	......	− 5·0
	....	......	......	......	......	......	......	......	......	23·5						
(2)	2 49 0 ,,	13·619	53·0	......	21,111											
	2 49 50 ,,	13.700	......	13·60	......	......	......	......	......	25·4	22·1	22·1	......	......	......	−10·0
(3)	2 54 0 ,,															
	2 59 0 ,,	12·826	......	......	23,164	......	ice.	......	......	......	......	......	......	......	......	−12·0
	2 59 10 ,,	12·714	......	......	23,215	......	......	......	......	24·2						
	2 59 20 ,,	12·614	......	......	23,377	......	......	......	......	......	......	......	......	......	− 8·0	
	2 59 40 ,,	12·932	......	......	22,762	......	......	......	......	24·0	......	......	......	......	......	−10·0
	3 0 0 ,,	13·132	......	......	22,295											
(4)	3 2 0 ,,	......	......	13·00												
	3 2 20 ,,	13·132	43·0	......	22,295	......	......	......	......	24·5	......	......	......	......	− 8·0	−10·0
	3 3 0 ,,	13·132	......	......	22,295											
(5)	....	......	......	......	......	......	......	......	......	24·8	......	......	......	......	......	−10·0
	3 4 30 ,,	13·132	43·0	......	22,386	......	......	......	......	28·0	......	......	......	......	− 9·0	
	....	12·932	......	13·20	22,607	......	......	......	......	28·1						
(6)	3 5 30 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	−10·0	
	3 5 40 ,,	12·932	42·0	13·80	22,607											
(7)	3 6 0 ,,	12·835	......	......	23,023	[sun shining.										
	3 6 10 ,,	......	......	......	......	......	......	......	......	24·0						
(8)	3 7 0 ,,	12·932	......	......	22,705	30·5	16·5	14·0	−24·5	......	31·2	31·2	0·0	31·2	......	− 8·0
	3 12 30 ,,	12·932	......	......	22,705	38·2	28·5									
	3 13 0 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	......	− 9·0
	3 13 15 ,,	13·627	......	......	21,977											
	3 13 20 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	−10·0	
	3 13 30 ,,	......	49·0	13·55	......	......	......	......	......	24·0						
	....	13·577	......	......	22,008											
(9)	3 13 50 ,,															
(10)	3 18 30 ,,	13·447	......	13·5	22,107											
	3 19 20 ,,	......	......	13·55	......	[sun shining.	......	......	......	......	......	......	......	......	......	−10·0
	3 19 30 ,,	......	......	......	......	34·0	29·1	4·9	20·5							
	3 19 40 ,,	......	......	......	......	......	......	......	......	25·0						
	3 19 50 ,,	......	......	......	......	......	......	......	......	24·8						
(11)	3 25 0 ,,	13·649	46·0	13·72	21,330											
(12)	3 26 0 ,,	......	......	14·50												
	3 32 0 ,,	......	......	16·00												
	3 33 0 ,,	16·780	42·0	......	15,984											
	3 34 0 ,,	17·529	......	17·42	13,320	37·5	25·0	12·5	9·8	32·8	......	......	......	......	......	12·5
	3 36 0 ,,	18·629	42·0	18·65	12,453	42·0	28·8	13·2	12·6	38·0	......	......	......	......	......	14·0
	3 38 0 ,,	......	......	......	......	44·0	31·5	12·5	5·4							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Thunder heard below. (2) A large town directly under us.
(3) Mr. Coxwell's pulse 90; Mr. Glaisher's 100, 107, and 110.
(4) Looked round; brandy necessary. (5) Difficult to get dew; Mr. Coxwell helped me.
(6) Difficult to get dew. (7) Hands and face blue.
(8) Aspirator difficult to work. (9) Thunder loud.
(10) Mr. Coxwell looked over ballast, said we had better be content today and not go higher; I wished to go up. (11) Unwell.
(12) Remarkable view; cirri far above; beautiful deep bluesky with cumuli far below. The earth and its fields very beautiful under us; here the earth not visible, a blue mist filling up the interstices between the cumuli; there the earth is perfectly clouded over by large plains or seas of cumulostratus, causing all below to be cloudy for many hundreds of square miles, then many square miles without a cloud to obscure the sun's rays; other places with detached cumuli, whose upper surfaces were connected in vast plains of a hillocky appearance; earth obscured in places by a blue haze or mist; then again cumuli with blue mist between them; the earth cannot be seen owing to the blue mist filling up the spaces between the cumuli. In another place, beautiful shining cumuli, and then a sea of detached clouds which I cannot describe. Open to the N., S.E., and S.W., obscured to N.E.; saw 50° of horizon same height as the eye on looking over the top of the car. A beautiful cloud due N., the same we passed through on leaving Wolverhampton, and has followed us all the way; King of clouds.

TABLE I.—Meteorological Observations made in Eight Balloon Ascents.

Wolverhampton, August 18, 1862.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	3 39 0 p.m.	20·020	45·0	20·05	10,624	44·2	30·5	13·7	14·4	40·7						
	3 39 30 ,,	......	......	20·55												
	3 40 0 ,,	20·717	46·0	......	10,224	45·5	31·0	14·5	14·4							
	3 41 0 ,,	......	......	21·50												
	3 41 30 ,,	21·617	......	......	8,764											
(1)	3 43 0 ,,	22·767	48·0	......	8,144											
	3 43 10 ,,	......	......	22·51	......	50·5	44·0	6·5	36·7							
	3 43 30 ,,	22·737	......	......	7,438											
(2)	3 45 0 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	......	38·6
	3 46 0 ,,															
	3 46 10 ,,	23·880	......	......	6,050											
(3)	3 46 30 ,,	23·930	......	......	5,979											
(4)	3 47 0 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	40·0	
(5)	3 48 0 ,,	23·980	......	......	5,922	53·5	43·5	10·0	33·6							
	3 49 0 ,,	24·280	53·0	24·42	5,621	......	......	......	......	50·0						
(6)	3 50 0 ,,	......	......	......	......	53·5	47·0	6·5	40·5							
(7)	3 50 10 ,,	24·876	......	......	5,021											
(8)	3 50 20 ,,	25·083	......	......	4,821	52·1	48·0	4·1	43·9							
(9)	3 51 0 ,,	25·364	......	......	4,521	51·5	49·2	2·3	44·8	51·5						
	3 53 0 ,,	......	......	......	......	51·0	50·0	1·0	48·9							
(10)	3 55 0 ,,															
(11)	3 58 0 ,,															
(12)	3 59 0 ,,															
(13)	4 4 0 ,,															
(14)	4 5 0 ,,	......	......	......	......	......	......	......	......	67·0						
	Crystal Palace, August 20, 1862.															
	6 5 0 p.m.	......	......	29·86	250	67·8	61·6	6·2	56·7							
	6 26 0 ,,	......	......	29·86	250	66·2	60·5	5·7	55·9	......	......	......	......	......	55·5	
(15)	6 27 0 ,,	......	......	29·85	250	66·0	60·5	5·5	56·0							
	6 28 30 ,,	......	......	29·66	430	65·2	59·5	5·7	54·8							
	6 29 0 ,,	......	......	29·62	450	64·6	59·0	5·6	54·3							
	6 29 30 ,,	......	......	29·48	530	64·2	58·5	5·7	53·7							
	6 29 40 ,,	......	......	29·40	602	64·1	58·2	5·9	53·3							
	6 29 50 ,,	......	......	29·33	662	63·5	57·5	6·0	52·5							
	6 30 0 ,,	......	......	29·28	707	63·2	57·5	5·7	52·7							
	6 31 0 ,,	......	......	28·95	1,037	63·0	57·2	5·8	52·3							
(16)	6 32 30 ,,	......	......	28·55	1,397	61·5	56·2	5·3	51·7							
(17)	6 33 0 ,,	......	......	28·45	1,497	61·5	56·0	5·5	51·3							
	6 34 0 ,,	......	......	28·00	1,912	58·5	54·2	4·3	50·5	......	......	......	......	......	52·1	
(18)	6 35 0 ,,	......	......	27·75	2,160	57·5	53·1	4·4	49·1							
(19)	6 35 30 ,,	......	......	27·65	2,257	56·2	53·0	3·2	50·0							
	6 36 0 ,,	......	......	27·40	2,408	56·0	52·5	3·5	49·2	......	......	......	......	......	51·5	
	6 37 0 ,,	......	......	......	......	55·2	52·1	3·1	49·1							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) The image of balloon and car on cloud very distinct. (2) Entering cloud, lost sight of sun.
(3) In a cloud; fog; can see nothing. (4) Balloon image on cloud magnificent.
(5) In cloud again; again lost sun. (6) Still in cloud.
(7) Saw the earth. (8) Packed up some instruments. (9) Misty. (10) Out of mist.
(11) Descending slowly; one or two men breaking through hedges.
(12) People approaching in different directions.
(13) Grapnel touched the earth. (14) Car touched the earth.
(15) Cheering from below. (16) Misty. (17) Over Palace Gardens.
(18) Counted ten carriages in train on Brighton Railway.
(19) Train on Beckenham line, twelve carriages, tank engine.

TABLE I.—Meteorological Observations made in Eight Balloon Ascents. Crystal Palace, August 20, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	
	6 37 10 p.m.	......	......	27·20	2,709	55·1	52·0	3·1	49·0							
(1)	6 37 30 „	......	......	26·95	2,959	54·2	51·5	2·7	48·8							
(2)	6 38 0 „	......	......	26·75	3,159	53·1	51·0	2·1	48·9	......	......	......	......	......	48·5	
(3)	6 39 0 „	......	......	26·55	3,359	52·8	50·5	2·3	48·2	......	......	......	......	......	48·0	
(4)	6 41 0 „	......	......	26·12	3,816	51·1	48·9	2·2	46·6							
(5)	6 41 30 „	......	......	25·95	3,986	50·5	48·5	2·0	46·4	......	......	......	......	......	44·2	
(6)	6 42 0 „	......	......	25·82	4,116	51·0	48·5	2·5	45·9							
(7)	6 43 0 „	......	......	25·68	4,256	50·0	47·8	2·2	45·5	......	......	......	......	......	44·2	
(8)	6 43 30 „	......	......	25·60	4,316	51·0	48·2	2·8	45·3							
(9)	6 47 0 „	......	......	25·55	4,366	50·5	47·2	3·3	43·7							
(10)	6 48 0 „	......	......	25·60	4,316	50·0	47·0	3·0	43·8							
(11)	6 49 0 „	......	......	25·75	4,116	49·2	47·5	1·7	45·7	......	......	......	......	......	44·5	
	6 49 30 „	......	......	25·80	4,055	50·5	48·5	2·0	46·4	......	......	......	......	......	44·5	
(12)	6 50 0 „	......	......	26·05	3,893	51·5	48·2	3·3	44·9	......	......	......	......	......	45·0	
	6 51 30 „	......	......	26·25	3,693	51·5	48·2	3·3	44·9	......	......	......	......	......	44·5	
(13)	6 52 0 „	......	......	26·35	3,593	51·5	48·2	3·3	44·9	......	......	......	......	......	44·5	
(14)	6 55 0 „	......	......	26·28	3,663	51·2	48·2	3·0	45·1	......	......	......	......	......	44·0	
(15)	6 56 0 „	......	......	26·25	3,693	50·9	48·2	2·7	45·4	......	......	......	......	......	44·0	
(16)	6 57 30 „	......	......	26·20	3,743	50·3	47·8	2·5	45·2	......	......	......	......	......	43·5	
(17)	6 58 0 „	......	......	26·15	3,793	49·8	47·2	2·6	44·4							
(18)	7 0 0 „	......	......	26·11	3,833	50·2	47·5	2·7	44·7	......	......	......	......	......	43·5	
(19)	7 1 20 „	......	......	26·08	3,863	49·8	47·2	2·6	44·4							
(20)	7 2 0 „	......	......	26·05	3,893	49·5	47·2	2·3	44·7							
(21)	7 4 0 „	......	......	25·85	4,052	48·2	46·5	1·7	44·7	......	......	......	......	......	43·0	
(22)	7 5 0 „	......	......	25·70	4,250	48·0	46·0	2·0	43·8							
(23)	7 7 0 „	......	......	25·58	4,384	47·0	45·1	1·9	43·0	......	......	......	......	......	43·0	
(24)	7 8 0 „	......	......	25·60	4,354	47·2	45·5	1·7	43·7	......	......	......	......	......	44·0	
(25)	7 9 0 „	......	......	25·68	4,278	48·1	46·2	1·9	43·9	......	......	......	......	......	43·5	
	7 10 0 „	......	......	26·50	3,405	48·2	46·5	1·7	44·7							
(26)	7 12 0 „	......	......	26·20	3,621	49·8	46·5	3·3	43·0	......	......	......	......	......	42·5	
(27)	7 13 0 „	......	......	26·45	3,468	51·0	48·2	2·8	45·3							
(28)	7 15 0 „	......	......	27·50	2,398	53·5	51·0	2·5	48·5	......	......	......	......	......	45·0	
(29)	7 16 0 „	......	......	27·70	2,198	54·2	51·5	2·7	48·9							
	7 16 30 „	......	......	28·03	1,871	54·8	52·0	2·8	49·3							
(30)	7 17 0 „	......	......	28·25	1,655	55·5	52·5	3·0	49·6	......	......	......	......	......	49·0	
(31)	7 18 0 „	......	......	28·50	1,417	56·5	53·2	3·3	50·1							
(32)	7 19 0 „	......	......	28·53	1,387	57·0	53·5	3·5	50·3							
(33)	7 19 10 „	......	......	28·55	1,367	57·0	53·5	3·5	50·3							
(34)	7 19 30 „	......	......	28·63	1,287	57·2	54·1	3·1	51·3	......	......	......	......	......	50·5	
	7 20 0 „	......	......	28·64	1,277	57·5	54·2	3·3	51·2							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15	16.

(1) Over Crystal Palace. (2) Misty all round; detached scud beneath.
(3) Gas in balloon cloudy; saw people as specks; clouds beneath as scud.
(4) Over a wood near the Palace.
(5) Gas very cloudy, could see it coming out as smoke.
(6) Misty; still over wood. (7) Clouds far below, but not under us.
(8) In cloud; earth just visible. (9) Could not see people, but could see carriages; lost sight of earth at $6^h\ 47^m\ 10^s$; just see roads.
(10) Earth visible at $6^h\ 48^m\ 40^s$; earth seen plainly, except where obscured by scud.
(11) 28 vibrations of magnet = $40^s{\cdot}5$, not good. (12) Could see the river; London obscured.
(13) Sand out. (14) Misty; Crystal Palace seen.
(15) Could see railway junction; heard engine. (16) Crystal Palace scarcely visible.
(17) Clouds below; saw a light on the river. (18) Tolling of bells distinct.
(19) Mist more on one side than the other; great buzzing below; shouting.
(20) Kennington Oval in sight; getting over London.
(21) Heard noise of people; gas cloudy and issuing from neck like smoke.
(22) Misty still; $7^h\ 6^m\ 15^s$, cold to sense; $7^h\ 6^m\ 45^s$, earth invisible.
(23) Over London; great noise; $7^h\ 7^m\ 30^s$, listened and heard the hum of London plainly.
(24) Great hum of London; exactly over Kennington Oval; saw lights; $7^h\ 8^m\ 42^s$, St. Mark's church under us. (25) Railway whistle heard.
(26) Lamps lighted along the roads. (27) Bell tolling; two clumps of light visible.
(28) Milbank Penitentiary and Vauxhall Bridge in sight.
(29) Shouting heard. (30) Lights on end of Vauxhall Bridge visible.
(31) Gas clear; see netting plainly.
(32) The upper and lower currents moving in different directions.
(33) Two gasometers under us near Kennington.
(34) Becalmed; visible from the earth.

TABLE I.—Meteorological Observations made in Eight Balloon Ascents. Crystal Palace, August 20, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	7 20 30 p.m.	......	......	28·62	1,297	57·5	54·2	3·3	51·2							
(1)	7 22 0 „	......	......	28·33	1,587	57·8	54·2	3·6	51·0							
	7 23 0 „	......	......	28·25	1,667	57·2	54·2	3·0	51·4							
(2)	7 24 0 „	......	......	28·01	1,907	56·8	53·5	3·3	50·5	......	......	......	......	......	49·0	
(3)	7 25 0 „	......	......	27·85	2,067	56·8	53·5	3·3	50·5							
	7 25 20 „	......	......	27·75	2,167	56·2	53·1	3·1	50·2							
	7 26 0 „	......	......	27·70	2,217	56·5	53·2	3·3	50·1							
(4)	7 26 30 „	......	......	27·70	2,217	56·5	53·5	3·0	50·7							
(5)	7 28 0 „	......	......	27·78	2,297	56·8	53·3	3·5	50·1							
(6)	7 29 30 „	......	......	27·70	2,217	55·9	52·9	3·0	50·1							
(7)	7 30 0 „	......	......	27·58	2,417	55·5	52·8	2·7	50·2							
(8)	7 32 0 „	......	......	......	......	55·2	52·2	3·0	51·3							
(9)	7 33 0 „	......	......	27·18	2,723	54·2	51·5	2·7	48·8							
	7 34 0 „	......	......	27·18	2,723	54·8	52·0	2·8	49·3							
(10)	7 35 0 „	......	......	27·22	2,683	55·2	52·0	3·2	47·9							
	7 36 0 „	......	......	27·30	2,603	54·8	51·6	3·2	48·5							
(11)	7 37 0 „	......	......	......	......	54·2	51·5	2·7	48·8							
(12)	7 40 0 „	......	......	27·03	2,873	53·5	49·8	3·7	46·1							
(13)	7 41 0 „	......	......	26·80	3,003	53·0	49·5	3·5	46·0							
(14)	7 42 0 „	......	......	26·10	3,703	51·2	48·0	3·2	44·7							
(15)	7 47 0 „	......	......	24·82	5,194	45·0	43·5	1·5	41·8							
	7 48 0 „	......	......	24·90	5,106	45·0	43·5	1·5	41·8							
(16)	7 49 0 „	......	......	24·18	5,900	43·0										
(17)	7 50 0 „	......	......	24·	......	43·0										
	7 52 0 „	......	......	24·88	5,200	43·3										
(18)	7 55 0 „	......	......	24·88	5,200	44·2										
(19)	7 56 0 „	......	......	24·92	5,160	44·2										
	7 57 0 „	......	......	25·00	5,080											
(20)	8 5 0 „	......	......	23·	......	55·0										
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) One-half of Kennington Oval is lighted; gas coming out from neck clear.
(2) Getting too dark to see the dew on the black bulb of the Hygrometer.
(3) Gas clear; great noise below; no wind; see earth; foggy below.
(4) Moving slowly near water. (5) Heard Victoria bell.
(6) Over Vauxhall Bridge; sand out.
(7) Saw Regent Street and Serpentine.
(8) Loud noise below; see the river for miles.
(9) Railway whistle; could distinguish the squares below; looked well lighted up.
(10) Going over Westminster; over Wellington Barracks.
(11) Gas cloudy; saw two bridges together over the river.
(12) Saw the Strand and Crescent lighted up brilliantly.
(13) London looks beautiful; Houses of Parliament, Charing Cross, and Piccadilly distinc dark below.
(14) Heard church clock strike.
(15) In cloud; London out of sight.
(16) Blue sky; clouds below a rich red; packed up Wet Bulb.
(17) In cloud; too dark to read instruments; $7^h\ 51^m$, counted ballast bags, we have fou $7^h\ 52^m$, gas cloudy; above clouds, beautiful view; London out of sight; $7^h\ 54^m$, gas cloudy; can scarcely see to write.
(18) The setting sun tinged the clouds with red.
(19) In cloud; just see above; earth pitchy dark.
(20) Agitated dry-bulb thermometer over side of the car. The hum of London was distinct, and then gradually died away. The balloon, after a time, was allowed to descend below the clouds; the appearance of London, as now viewed through mist, was that of an immense conflagration; the lights were not, as before, innumerable and distinct points, but large in volume, united, and of wonderful extent; this appearance continued till we again ascended above the clouds, where it was much lighter, but not sufficiently so to enable the instruments to be read; and thus we journeyed till again descending below the clouds, we heard the lowing of cattle, indicating that we were some distance from London; the balloon was allowed to descend very slowly, for it was quite dark. Mr. Coxwell had sand ready to discharge on the instant, which he did on nearing trees, hedges, &c., and thus we passed over them and dropped gently to the ground, in the centre of a field near Hendon, a little before 10 o'clock. The grapnel was not used, as Mr. Coxwell was fearful of hurting some one, or otherwise doing injury.

TABLE I.—Meteorological Observations made in Eight Balloon Ascents. Hendon, August 21, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	4 30 0 a.m.	......	......	29·63	320	60·8	59·5	1·3	58·4							
	4 31 0 „	......	......	29·59	358	60·0	58·5	1·5	57·2							
	4 33 0 „	......	......	29·58	367	58·9	58·0	0·9	57·2							
(1)	4 35 0 „	......	......	29·45	490	59·2	59·0	0·2	58·9							
	4 36 0 „	......	......	29·20	728	59·0	59·0	0·0	59·0							
	4 38 0 „	......	......	......	......	58·2	56·5	1·7	55·0							
	4 39 0 „	......	......	28·78	1,130	57·8	54·8	3·0	52·2							
(2)	4 40 0 „	......	......	28·70	1,210	57·5	54·2	3·3	51·2							
(3)	4 41 0 „	......	......	28·62	1,286	57·2	53·8	3·4	50·6							
(4)	4 42 0 „	......	......	28·58	1,326	56·8	53·8	3·0	51·0							
(5)	4 44 0 „	......	......	28·18	1,706	55·5	53·5	2·0	51·2							
(6)	4 45 0 „	......	......	27·90	2,000	55·0	53·0	2·0	51·1							
(7)	4 49 0 „	......	......	26·95	2,930	52·2	49·8	2·4	47·4							
(8)	4 51 0 „	......	......	26·40	3,510	49·8	47·2	2·6	44·4							
	4 52 0 „	......	......	25·95	3,951	47·0	44·2	2·8	41·0							
	4 53 0 „	......	......	25·78	4,138	46·5	43·8	2·7	40·7							
(9)	4 55 0 „	......	......	25·05	4,927	43·8	42·8	1·0	41·5							
	4 55 30 „	......	......	24·72	5,260	43·2	42·2	1·0	41·0							
(10)	4 56 0 „	......	......	......	......	42·0	41·2	0·8	40·2							
	4 57 0 „	......	......	24·45	5,557	40·2	40·0	0·2	39·8							
(11)	4 57 30 „	......	......	24·05	5,989	39·7	39·7	0·0	39·7							
(12)	4 58 0 „															
(13)	4 58 30 „	......	......	23·70	6,367											
(14)	5 0 0 „	......	......	23·58	6,510	38·5	37·5	1·0	36·0							
(15)	5 1 0 „															
(16)	5 1 20 „															
(17)	5 3 0 „	......	......	23·75	6,336	40·7	37·0	3·7	32·3							
(18)	5 4 0 „	......	......	23·68	6,413	41·5	37·2	4·3	31·8							
(19)	5 5 0 „	......	......	23·20	6,967	40·5	37·0	3·5	32·5							
	5 7 0 „	......	......	23·15	7,027	40·5	36·5	4·0	30·9							
(20)	5 8 0 „	......	......	23·10	7,087	41·0	35·8	5·2	29·2							
	5 10 0 „	......	......	22·48	7,810	37·5	32·5	5·0	25·5							
(21)	5 11 0 „	......	......	22·10	8,281	37·2	32·0	5·2	24·7							
	5 12 0 „	......	......	22·00	8,406	35·0	30·5	4·5	23·3							
	5 14 0 „	......	......	21·65	8,841	35·2	29·8	5·4	21·2							
	5 15 0 „	......	......	21·40	9,150	34·8	29·2	5·6	20·2							
	5 15 30 „	......	......	21·10	9,525	33·0	28·2	4·8	18·6							
	5 16 0 „	......	......	20·65	10,085	32·8	26·0	6·8	12·4							
	5 17 0 „	......	......	20·45	10,335	31·9	26·0	5·9	10·1							
(22)	5 18 0 „	......	......	20·30	10,472	31·0	26·5	4·5	14·3							
(23)	5 20 0 „	......	......	19·70	11,222	29·8	(31)									
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Line of light to the east. (2) Thick mist.
(3) Clouds broken in the east; beautiful lines of light; gold and silver tints.
(4) Balloon spirating; heard voices calling from below.
(5) Clouds beautiful; could see the earth in the distance.
(6) Very misty; blocks of clouds above; cold to sense; voices calling from below: Daniell's Hygrometer was broken the night before; I had attempted to mend it, but it would not work.
(7) Scud below creeping over the earth; cumuli on same level in the distance; blue clouds above; over Mr. Wolley's farm. (8) Heard railway train.
(9) A great many ponds of water in sight; entered the clouds a few seconds afterwards.
(10) Lost sight of earth.
(11) Great masses of alpine cloud; beautiful cumulus cloud.
(12) In cloud, surrounded by white mist. (13) Sensibly lighter; a light wind.
(14) Valley of cloud; in a basin; on reaching its limit saw the sun rising.
(15) Like a lake under the sun; immense ocean of cloud; magnificent view.
(16) Under the sun a lake; mountains of cloud to the left; fine cloudscape.
(17) Lost sight of sun; earth visible underneath; misty.
(18) Deep ravines and shaded parts in clouds; sun again rising in the same magnificent way; silver and golden tints.
(19) Lake and mountain scenery; clouds near us sweeping boldly away.
(20) Moon seen. (21) Cold to the sense; gas clear.
(22) Applied water to Wet Bulb.
(23) Mr. Glaisher's pulse 88.

TABLE I.—Meteorological Observations made in Eight Balloon Ascents. Hendon, August 21, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	5 21 0 a.m.	......	......	19·45	11,616	27·8										
(2)	5 22 0 „	......	......	19·09	12,254	25·5	(31)									
(3)	5 23 0 „	......	......	18·90	12,421	23·2										
(4)	5 24 0 „	......	......	18·90	12,421	23·3	(31)									
	5 24 30 „	......	......	18·80	12,571	23·0										
	5 25 0 „	......	......	18·70	12,691	23·3										
	5 26 0 „	......	......	18·60	12,831	23·5	(29·5)									
	5 27 0 „	......	......	18·42	13,080	24·0	(29·0)									
	5 29 0 „	......	......	18·20	13,381	24·0	19·5	4·5	−7·1							
	5 29 30 „	......	......	18·15	13,456	23·5	18·5	5·0	9·8							
	5 30 30 „	......	......	18·00	13,665	25·0	20·2	4·8	6·3							
	5 31 0 „	......	......	17·90	13,680	22·2	16·2	6·0	23·4							
	5 32 0 „	......	......	17·88	13,685	21·5	16·0	5·5	20·0							
	5 32 10 „	......	......	......	......	21·0	14·5	6·5	30·2							
	5 32 30 „	......	......	17·82	13,799	19·5	13·8	5·7	27·4							
	5 34 0 „	......	......	17·78	13,875	19·5	13·2	6·3	32·4							
(5)	5 34 30 „	......	......	17·78	13,875	19·3	12·2	7·1	39·2							
	5 35 0 „	......	......	17·70	14,027	19·5	12·2	7·3	40·6							
(6)	5 36 0 „	......	......	17·72	13,989	19·9	13·0	6·9	36·2							
	5 36 30 „	......	......	17·71	14,008	20·0	13·5	6·5	22·6							
	5 37 0 „	......	......	17·70	14,027	20·5	14·0	6·5	21·5							
	5 38 0 „	......	......	17·65	14,121	21·5	14·9	6·6	29·5							
	5 38 30 „	......	......	17·62	14,178	22·5	16·5	6·0	22·1							
	5 40 0 „	......	......	17·68	14,064	24·0	18·0	6·0	17·5							
	5 42 0 „	......	......	17·68	14,068	24·8	20·0	4·8	6·5							
(7)	5 43 0 „	......	......	17·62	14,178	24·8	20·5	4·3	3·2							
	5 44 0 „	......	......	17·62	14,178	25·2	20·5	4·7	4·4							
	5 44 30 „	......	......	17·62	14,178	26·5	19·5	7·0	14·4							
	5 45 0 „	......	......	17·58	14,254	26·5	19·7	6·8	13·2							
	5 45 45 „	......	......	17·58	14,254	26·3	19·9	6·4	12·4							
	5 46 0 „	......	......	17·58	14,254	27·2	20·0	7·2	12·4							
	5 46 15 „	......	......	17·58	14,254	27·2	20·0	7·2	12·4							
	5 47 0 „	......	......	17·56	14,355	27·6	20·0	7·6	13·1							
(8)	5 48 0 „	......	......	17·57	14,273	26·0	20·5	5·5	7·4							
(9)	5 48 30 „	......	......	17·58	14,254	25·5										
	5 50 0 „	......	......	17·57	14,273	25·5	19·0	6·5	15·4							
	5 50 45 „	......	......	17·58	14,254	25·1	18·9	6·2	15·3							
(10)	5 51 0 „	......	......	17·56	14,318	25·2	18·1	7·1	21·8							
	5 52 0 „	......	......	17·60	14,258	24·1	18·8	5·3	12·5							
(11)	5 55 0 „	......	......	17·62	14,228	23·8	17·5	6·3	19·7							
	5 56 0 „	......	......	17·62	14,228	23·8	17·8	6·0	17·7							
	5 56 30 „	......	......	17·62	14,228	23·0	17·5	5·5	17·0							
(12)	5 57 0 „	......	......	17·62	14,228	23·1	17·1	6·0	20·5							
	5 57 30 „	......	......	17·61	14,243	22·5	17·1	5·4	17·6							
	5 58 0 „	......	......	17·60	14,258	23·0	16·5	6·5	24·3							
(13)	5 58 30 „	......	......	17·62	14,228	23·4	16·5	6·9	25·6							
	5 59 30 „	......	......	17·62	14,228	23·4	16·4	7·0	27·5							
(14)	6 0 0 „	......	......	17·63	14,213	23·5	16·5	7·0	−27·4							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Master Glaisher's pulse 89. (2) Captain Percival's pulse 88.
(3) Mr. Coxwell's pulse 90. (4) Mr. Ingelow's pulse 100.
(5) Magnificent peaks of cloud in distance, rising from a base like seas of cotton; ga[illegible] transparent. (6) Network looks beautiful, perfect symmetry of form. Feet very cold; our boots covered with ice.
(7) Ice on Wet Bulb and connecting-thread. (8) Sea of clouds below.
(9) Fine echo from balloon. (10) Sun obscured by thin strati.
(11) Sea of clouds all round. (12) Stratus same height; cirrus above. (13) Valve twice opened.
(14) Beautiful sea of cloud everywhere; dropped paper, visible two minutes.

TABLE I.—Meteorological Observations made in Eight Balloon Ascents. Hendon, August 21, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	6 1 0 a.m.	......	......	17·70	14,108	24·2	16·5	7·7	−29·0							
	6 2 0 ,,	......	......	17·90	13,802	24·5	16·5	8·0	29·4							
	6 2 30 ,,	......	......	17·95	13,715	24·2	16·8	7·4	17·0							
	6 3 0 ,,	......	......	18·10	13,484	23·8	16·5	7·3	26·7							
(1)	6 4 0 ,,	......	......	18·11	13,479	24·2	16·5	7·7	19·0							
(2)	6 4 30 ,,	......	......	18·15	13,419	24·2	16·7	7·5	27·7							
	6 5 30 ,,	......	......	18·23	13,299	25·2	18·2	7·0	17·3							
	6 6 0 ,,	......	......	18·30	13,194	25·2	19·2	6·0	13·9							
	6 6 15 ,,	......	......	18·35	13,119	25·2	18·9	6·3	15·9							
	6 8 0 ,,	......	......	......	......	24·5	18·8	5·7	−13·8							
(3)	6 12 0 ,,	......	......	19·07	12,174	30·0	24·0	6·0	+ 5·1							
	6 12 20 ,,	......	......	19·11	12,123	29·8	23·0	6·8	+ 1·6							
	6 13 0 ,,	......	......	19·15	12,070	27·8	22·0	5·8	+ 1·8							
(4)	6 13 30 ,,	......	......	19·28	11,901	27·5	21·2	6·3	− 6·8							
	6 14 0 ,,	......	......	19·30	11,875	27·8	21·3	6·5	− 5·4							
	6 14 30 ,,	......	......	19·30	11,875	27·5	21·5	6·0	− 5·4							
	6 15 0 ,,	......	......	19·30	11,875	27·8	21·5	6·3	− 4·4							
	6 16 0 ,,	......	......	19·65	11,420	31·5	23·8	7·7	− 5·5							
	6 17 0 ,,	......	......	19·80	11,225	32·0	25·0	7·0	+ 8·8							
	6 18 0 ,,	......	......	20·05	10,871	33·8	26·0	7·8	17·3							
	6 18 15 ,,	......	......	20·20	10,688	34·5	27·1	7·4	14·7							
	6 18 30 ,,	......	......	20·30	10,566	36·5	28·2	8·3	16·0							
	6 19 0 ,,	......	......	20·80	9,936	37·0	29·2	7·8	18·1							
(5)	6 20 0 ,,	......	......	21·00	9,650	37·0	29·5	7·5	18·7							
	6 22 0 ,,	......	......	21·70	8,810	41·5	31·0	10·5	18·0							
(6)	6 23 30 ,,	......	......	22·20	8,196	43·5	32·2	11·3	18·7							
(7)	6 24 0 ,,	......	......	22·33	8,040	43·0	33·0	10·0	21·0							
(8)	6 25 0 ,,	......	......	22·65	7,655	42·8	32·5	10·3	20·1							
	6 25 30 ,,	......	......	22·72	7,573	43·5	33·0	10·5	20·5							
(9)	6 27 0 ,,	......	......	22·95	7,293	44·5	33·0	11·5	19·6							
(10)	6 27 30 ,,	......	......	23·08	7,141	44·2	34·0	10·2	22·0							
	6 28 0 ,,	......	......	23·12	7,094	43·0	35·2	7·8	25·8							
(11)	6 28 30 ,,	......	......	23·11	7,106	42·8	36·0	6·8	27·8							
(12)	6 29 0 ,,	......	......	23·20	7,001	43·0	37·2	5·8	30·2							
(13)	6 30 0 ,,	......	......	23·30	6,884	43·0	38·5	4·5	33·1							
(14)	6 31 0 ,,	......	......	23·28	6,907	42·0	40·5	1·5	38·7							
(15)	6 31 30 ,,	......	......	23·40	6,767	42·5	41·0	1·5	39·2							
	6 32 0 ,,	......	......	23·50	6,650	42·0	40·5	1·5	38·7							
	6 32 15 ,,	......	......	23·60	6,533	42·0	40·5	1·5	38·7							
(16)	6 33 0 ,,	......	......	24·00	6,058	41·5	39·8	1·7	37·7							
	6 33 30 ,,	......	......	24·22	5,819	41·8	39·8	2·0	37·3							
	6 33 40 ,,	......	......	24·50	5,515	41·5	39·8	1·7	37·7							
	6 34 0 ,,	......	......	24·70	5,298	42·2	40·5	1·7	37·9							
(17)	6 35 0 ,,	......	......	24·80	5,189	43·5	41·0	2·5	38·0							
	6 36 0 ,,	......	......	24·90	5,080	44·2	41·1	3·1	37·5							
	6 36 30 ,,	......	......	24·92	5,058	43·8	41·2	2·6	39·2							
	6 37 0 ,,	......	......	25·10	4,851	45·2	41·5	3·7	+37·2							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Valve opened.
(2) Valve opened.
(3) Dropped large piece of paper with our names written on it.
(4) Train heard.
(5) Could hear the watch tick when the ear was above it, but not when below.
(6) Gun heard.
(7) Balloon reflection on cloud, surrounded by prismatic colours.
(8) Dog barking; railway train heard.
(9) Clouds approached.
(10) Lost sight of sun.
(11) In mist.
(12) Just entering the clouds.
(13) Top of cloud.
(14) Valve opened.
(15) Fog; mist.
(16) Earth visible.
(17) Passed through cloud about 2000 feet in thickness, and found the country without a ray of sun, misty and dark.

Table I.—Meteorological Observations made in Eight Balloon Ascents. Hendon, August 21, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Dry and Wet Thermometers (aspirated). Wet.	Dry and Wet Thermometers (aspirated). Diff.	Dry and Wet Thermometers (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	6 37 30 a.m.	......	......	25·20	4,745	45·0	42·2	2·8	38·9							
	6 37 45 „	......	......	25·30	4,639	45·0	42·2	2·8	38·9							
	6 38 0 „	......	......	25·60	4,320	46·0	43·2	2·8	40·0							
(1)	6 38 30 „	......	......	25·92	3,980	46·8	43·8	3·0	40·8							
	6 39 0 „	......	......	26·15	3,751	47·8	44·8	3·0	41·6							
	6 40 0 „	......	......	26·40	3,502	48·2	45·1	3·1	42·6							
(2)	6 41 0 „	......	......	26·60	3,300	49·5	47·2	2·3	44·7							
	6 42 0 „	......	......	26·80	3,186	50·0	47·8	2·2	45·5							
	6 42 15 „	......	......	27·00	2,872	51·0	48·2	2·8	45·3							
	6 43 0 „	......	......	27·20	2,673	51·5	48·2	3·3	44·8							
	6 44 0 „	......	......	27·70	2,177	53·5	50·1	3·4	46·7							
	6 45 0 „	......	......	27·98	1,898	54·5	51·2	3·3	48·0							
	6 45 30 „	......	......	28·20	1,684	55·5	52·0	3·5	48·6							
	6 46 0 „	......	......	28·40	1,489	56·0	52·5	3·5	47·8							
(3)	7 10 0 „	......	......	29·42	513	61·8	56·0	5·8	51·1							
	Crystal Palace, September 1, 1862.															
(4)	4 5 0 p.m.	......	......	......	......	63·0	59·9	3·1	57·3							
(5)	4 40 0 „	29·80	......	29·78	250	63·8	59·8	4·0	56·5							
(6)	4 45 0 „	......	......	29·78	250	65·0	59·8	5·2	55·5	......	......	......	......	......	52·0	
	4 52 0 „	......	......	......	270	64·0	59·8	4·2	56·3							
(7)	4 53 0 „	29·45	......	29·65	320	63·0	57·0	6·0	51·9							
	4 53 20 „	29·15	......	29·20	720	61·1	56·5	4·6	52·5	......	......	......	......	......	52·0	
	4 53 40 „	28·80	......	28·90	996	59·2	54·5	4·7	50·3							
	4 54 0 „	28·52	......	28·55	1,332	57·2	54·1	3·1	51·2							
	4 54 30 „	28·10	......	28·00	1,868	55·2	52·5	2·7	47·8							
(8)	4 55 0 „	27·80	......	27·65	2,214	54·2	51·0	3·2	48·1							
(9)	4 56 4 „									......	......	......	......	......	45·1	
(10)	4 57 0 „	27·30	......	27·21	2,654	52·2	49·5	2·7	46·7							
	4 58 30 „	26·99	......	26·92	2,940	51·5	47·8	3·7	44·0							
(11)	4 59 0 „	26·90	......	26·91	2,950	50·5	47·2	3·3	43·7	......	......	......	......	......	47·8	
(12)	5 1 0 „	26·80	......	26·78	3,080	50·0	46·5	3·5	42·8							
(13)	5 1 30 „	26·70	......	26·69	3,170	50·0	46·5	3·5	42·8	......	......	......	......	......	43·0	
	5 2 15 „															
	5 3 0 „	26·65	......	26·61	3,257	49·5	46·5	3·0	43·3							
(14)	5 4 0 „	26·60	......	26·60	3,268	49·2	46·0	3·2	42·6	......	......	......	......	......	43·5	
(15)	5 5 30 „	26·45	......	26·46	3,408	49·2										
(16)	5 5 40 „	26·45	......	26·46	3,408	49·2	44·8	4·4	40·1							
	5 6 30 „	26·40	......	26·41	3,458	49·5	44·8	4·7	39·8							
(17)	5 7 0 „															
(18)	5 8 0 „	26·40	......	26·41	3,458	49·5	44·2	5·3	38·5	......	......	......	......	......	38·5	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Biggleswade under us. (2) Shouting heard; people not visible.
(3) On the ground, four miles from Biggleswade. In this ascent the Aneroid Baromet[er] was read by Mr. Ingelow.
(4) Clouds, stratus, about a mile high.
(5) Blue sky near horizon, which was moderately clear.
(6) Wind E.N.E. (7) $4^h\ 53^m\ 40^s$, over south tower of the Pala[ce]
(8) The whole course of the Thames to Richmond is in sight; gas cloudy.
(9) Mouth of the Thames and its course up to and beyond Richmond in sight.
(10) Palace like a mist; heard railway whistle, and close over Norwood.
(11) Railway whistle heard; two trains together.
(12) Rays of sun lighting up Gravesend.
(13) Gas very cloudy; rays of sun perpendicularly downwards; over Mitcham Common.
(14) Over Mitcham Common; people not visible.
(15) Carriages visible; wind E.N.E.
(16) Cumulus in horizon; apparently at a lower elevation.
(17) Palace beautiful. (18) Over water.

Table I.—Meteorological Observations made in Eight Balloon Ascents. Crystal Palace, September 1, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 1.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	5 9 0 p.m.	26·50	......	26·50	3,368	49·8	44·2	5·6	38·2							
	5 10 0 „	26·50	......	26·55	3,318	50·0	44·8	5·2	39·3							
	5 10 30 „	26·48	......	26·51	3,358	50·0	44·8	5·2	39·3							
(2)	5 11 30 „	26·30	......	26·31	3,560	50·0	44·8	5·2	39·3							
(3)	5 13 0 „	26·20	......	26·19	3,680	48·8	43·5	5·3	37·8							
(4)	5 13 20 „									......	......	......	......	......	38·5	
(5)	5 15 0 „	26·20	......	26·19	3,680	49·2	44·1	5·1	38·6							
(6)	5 15 40 „															
(7)	5 16 0 „	26·25	......	26·25	3,620	49·2	44·0	5·2	38·4							
(8)	5 17 0 „	26·29	......	26·29	3,580	49·2	44·1	5·1	38·6	......	......	......	......	......	38·4	
(9)	5 17 40 „															
(10)	5 19 0 „	26·28	......	26·28	3,590	48·8	43·1	5·7	37·0							
(11)	5 20 0 „	26·29	......	26·29	3,583	47·8	42·8	5·0	37·3	......	......	......	......	......	35·0	
(12)	5 23 0 „	25·95	......	25·95	3,937	47·2	43·0	4·2	38·3	......	......	......	......	......	33·1	
	5 23 30 „	25·94	......	25·91	3,977	47·2	42·1	5·1	36·4							
	5 24 0 „	25·90	......	25·90	3,987	47·0	42·1	4·9	36·6							
(13)	5 25 0 „	25·90	......	25·90	3,987	47·2	42·5	4·7	37·2	......	......	......	......	......	35·0	
(14)	5 26 0 „	26·09	......	26·05	3,837	48·1	42·5	5·6	36·4							
	5 26 30 „	26·15	......	26·15	3,737	48·2	43·5	4·7	38·4							
	5 27 0 „	26·20	......	26·20	3,687	48·5	43·5	5·0	38·0							
(15)	5 28 0 „	26·10	......	26·10	3,787	47·8	42·5	5·3	36·6							
	5 29 0 „	25·95	......	26·00	3,887	47·2	42·1	5·1	36·4	......	......	......	......	......	33·0	
(16)	5 30 0 „	25·88	......	25·88	4,000	47·2	42·5	4·7	36·3							
(17)	5 31 0 „	25·75	......	25·79	4,090	47·2	42·1	5·1	36·4							
(18)	5 32 0 „	25·65	......	25·70	4,180	46·2	41·5	4·7	36·1	......	......	......	......	......	35·5	
	5 33 0 „	25·69	......	25·69	4,190	46·2	41·5	4·7	36·1							
	5 35 0 „	25·69	......	25·69	4,190	46·1	41·5	4·6	36·0	......	......	......	......	......	34·0	
(19)	5 36 0 „															
(20)	5 37 0 „	25·96	......	25·98	3,900	47·2	42·8	4·4	37·9							
(21)	5 37 30 „	26·20	......	26·19	3,690	47·2	42·5	4·7	37·2							
	5 40 0 „	26·55	......	26·50	3,362	47·5	43·2	4·3	38·4	......	......	......	......	......	37·5	
(22)	5 41 0 „									......	......	......	......	......	38·0	
	5 42 0 „	26·82	......	26·82	3,040	48·5	44·2	4·3	39·6							
	5 43 0 „	26·95	......	26·95	2,910	49·2	45·5	3·7	41·6							
	5 44 0 „	26·95	......	26·95	2,910	49·8	46·1	3·7	42·2							
(23)	5 45 0 „	26·90	......	26·88	2,970	49·2	46·1	3·1	42·8	......	......	......	......	......	41·5	
(24)	5 46 0 „															
(25)	5 47 0 „															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Wind changed to E.
(2) Wind E.S.E.
(3) Over corn-fields.
(4) Three trains in sight; gas cloudy.
(5) Gun heard.
(6) Gas escaping from balloon at safety-valve very fast.
(7) Apparently on a level with cumuli in distance; train; sun shining in distance.
(8) Train seen; old Battersea Bridge near; South-Western Railway under us; near to Maldon; moving in the direction of Richmond Park; newly made reservoir (of red bricks) under us; dog barking; wind E.N.E.
(9) Over embankment of South-Western Railway; Thames very clear.
(10) Crystal Palace visible from the ring.
(11) Seemed to have changed direction; could see the four black lines of railway.
(12) The islands in the Thames near Mortlake very clear.
(13) Supposed nearly over Hampton Court.
(14) Gas very cloudy.
(15) Shouting below.
(16) Gas coming out of valve fast like smoke; higher than all clouds near us; could see the mouth of the Thames very plainly; some said they could see the sea.
(17) Clouds follow the course of the Thames from its mouth up to the higher parts of the river, seemingly following the whole course of the river, and confined to it throughout; quite clear where we are; clouds far below, moving apparently at right angles to us.
(18) Thames Ditton under us.
(19) Fast train on South-Western Railway; upper current W.?; clouds meeting us, moving at right angles to our motion; clouds very low.
(20) Clouds passing quickly below us; can scarcely see the earth on one side; clouds still follow the course of the river.
(21) Can see the earth at intervals through the clouds.
(22) Clouds meeting us of three different degrees of white—the top bluish white, the middle the pure white of the cumulus, the lower blackish white, and from which rain was falling upon the earth.
(23) Train with 29 carriages seen; gas beautifully clear; netting seen through it, and balloon apparently empty.
(24) Can see carts; hear people shouting.
(25) Saw a black dog, and heard him bark.

TABLE I.—Meteorological Observations made in Eight Balloon Ascents. Crystal Palace, September 1, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 1.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	5 48 0 p.m.	26·68	......	26·68	3,170	48·2	44·5	3·7	40·4							
	5 50 0 ,,	26·99	......	26·90	2,950	49·2	44·5	4·7	39·5							
	5 52 0 ,,	......	......	27·49	2,356	50·0	46·5	3·5	42·8							
	5 53 0 ,,	......	......	27·40	2,446	50·5	47·2	3·3	43·7							
	5 53 30 ,,	......	......	27·40	2,446	50·5	47·8	2·7	45·0	......	......	......	......	......	43·5	
	5 54 0 ,,	......	......	27·44	2,406	50·0	48·0	2·0	45·9							
(1)	5 55 0 ,,															
	5 56 0 ,,	27·60	......	27·55	2,290	51·0	49·2	1·8	47·3							
(2)	5 57 0 ,,	27·65	......	27·65	2,190	51·2	49·2	2·0	47·1							
	5 57 30 ,,	......	......	......	......	52·0	50·5	1·5	49·0	......	......	......	......	......	46·0	
(3)	5 58 0 ,,	......	......	27·95	1,890	52·0	50·5	1·5	49·0							
	5 58 10 ,,	......	......	28·05	1,790	52·5	50·0	2·5	47·5							
	5 58 30 ,,	28·12	......	......	......	53·2	50·5	2·7	47·8							
	5 59 0 ,,	......	......	28·22	1,620	53·2	50·5	2·7	47·8							
	5 59 30 ,,	......	......	28·30	1,540	53·8	51·0	2·8	48·3	......	......	......	......	......	50·0	
(4)	6 0 0 ,,	......	......	28·45	1,417	54·0	51·0	3·0	48·1							
(5)	6 0 20 ,,															
	6 0 30 ,,	......	......	28·52	1,347	54·2	51·2	3·0	48·3							
(6)	6 1 0 ,,	......	......	28·50	1,367											
(7)	6 2 0 ,,	......	......	28·30	1,567	54·0	51·5	2·5	49·0							
	6 3 0 ,,	......	......	28·19	1,677	54·0	51·5	2·5	49·0	......	......	......	......	......	49·5	
	6 3 30 ,,	......	......	28·05	1,817	54·0	51·5	2·5	49·0							
	6 4 0 ,,	......	......	27·81	2,057	54·2	51·5	2·7	48·9							
(8)	6 5 0 ,,	......	......	27·75	3,117	53·5	51·5	2·0	49·5	......	......	......	......	......	48·0	
	6 5 30 ,,	......	......	27·75	3,117	53·5	51·5	2·0	49·5							
(9)	6 6 0 ,,	......	......	27·75	3,117	54·2	51·5	2·7	48·9							
(10)	6 6 15 ,,	......	......	27·79	3,077	54·2	51·5	2·7	48·9							
	6 6 30 ,,	......	......	27·80	3,067	53·5	51·5	2·0	49·5							
	6 8 0 ,,	......	......	27·90	2,967	53·5	51·5	2·0	49·5							
	6 8 30 ,,	......	......	28·00	2,867	53·5	51·5	2·0	49·5							
(11)	6 9 0 ,,	......	......	28·20	2,667	54·5	51·8	2·7	49·2							
(12)	6 10 0 ,,															
(13)	6 13 0 ,,															
(14)	6 15 0 ,,															
	Wolverhampton, September 5, 1862.															
(15)	0 0 0 p.m.	29·40	60·0	29·40	490	59·5	54·2	5·3	49·5	59·5	59·2	54·3	4·9	49·9	49·0	45·5
(16)	1 3 20 ,,	29·17														
	1 5 0 ,,	29·17	......	......	720	59·0	54·5	4·5	50·5	59·0						
(17)	1 5 10 ,,	28·97	......	29·10	909											
	1 5 20 ,,	......	......	29·05	909	57·2	53·5	3·7	50·1							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Began to get grapnel out.
(2) Rain on balloon; a rainbow seen.
(3) A vertical rainbow visible.
(4) Over the Hermitage Plantation; shout
(5) Over Basingstoke Canal.
(6) Took down Mercurial Barometer.
(7) Over plantation.
(8) Over Woking Common; sheep seen.
(9) Over corn-fields.
(10) Over farmhouse.
(11) Packed up instruments.
(12) Over meadows; gas out.
(13) Over canal, and getting over clover-field.
(14) Reached the earth—two bumps; near the Hermitage Plantation, the property of — Lindsay, Esq. Rain had been falling nearly all the afternoon; during the whole time no ray of sun fell upon us; the sky was covered with clouds; the earth was very dark.

In this ascent the Barometers were read by Mr. MacDonald, who also took charge of Daniell's Hygrometer.

(15) Out of doors in shade, near Meter House.
(16) Left the earth.
(17) Balloon spirating.

TABLE I.—Meteorological Observations made in Eig[…] Balloon Ascents. Wolverhampton, September 5, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 1.	Height above sea-level.	Dry and Wet Th[…]mometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	1 5 30 p.m.	28.57	58.0	28.60	1,290											
(1)	1 5 50 „	......	......	......	......	56.5	52.5	4.0	47.9							
	1 6 0 „	28.38	57.0	28.35	1,480	55.5	51.1	4.4	46.9							
	1 10 0 „	26.19	55.0	26.20	3,660	45.5	43.5	2.0	41.2	......	46.0	43.8	2.2	41.3	......	42.0
	1 11 0 „	......	......	25.82	4,116	44.2	42.5	1.7	40.4	44.2						
	1 11 30 „	25.491	54.0	25.62	4,388	......	......	......	......	......	43.3	41.5	1.8	39.3	......	38.5
	1 12 0 „	24.994	53.0	......	4,920	42.0	40.5	1.5	38.7							
	1 12 30 „	24.894	......	......	5,011	41.0	39.8	1.2	38.3	40.7						
	1 13 0 „	24.30	......	24.45	5,675	39.5	38.2	1.3	36.5	......	......	......	......	......	38.0	
(2)	1 13 30 „	24.25	52.0	......	5,722	38.0	37.2	0.8	36.1							
(3)	1 14 0 „															
(4)	1 14 30 „	23.70	......	23.90	6,330	36.5	36.5	0.0	36.5	36.5						
(5)	1 16 0 „	23.35	50.0	23.40	6,729											
(6)	1 16 30 „	......	......	......	......	36.3	36.3	0.0	36.3	36.0						
	1 17 0 „	23.20	50.0	......	6,914	......	......	......	......	......	36.0	36.0	0.0	36.0	......	35.5
(7)	1 17 20 „	......	......	......	......	38.2	36.1	2.1	33.3	39.5						
(8)	1 17 40 „	22.658	49.0	22.71	7,575	39.0	35.2	3.8	30.2	40.0						
(9)	1 21 0 „	20.717	46.0	20.60	9,926	33.5	31.1	2.4	26.6	32.1						
(10)	1 22 0 „	20.070	45.0	20.17	10,770	31.1	30.5	0.6	28.9	31.2	......	......	......	......	......	25.0
	1 24 0 „	18.727	42.0	......	12,568	......	......	......	......	26.5	24.5	23.0	1.5	14.5	......	25.0
	1 25 30 „	17.931	......	18.10	13,715	25.5	25.0	0.5	22.3							
	1 26 0 „	......	......	......	......	23.2	25.0									
	1 27 0 „	16.936	38.0	16.90	15,184											
	1 27 30 „	......	......	......	......	17.2	23.									
	1 28 0 „	16.686	36.0	16.65	15,510	......	......	......	......	18.0						
(11)	1 28 30 „	......	......	......	......	16.5	19.0	......	......	17.9	17.0	24.0				
	1 29 0 „	16.046	32.0	......	16,520	16.5	17.0									
	1 29 20 „	......	......	15.82	......	......	......	......	......	17.8	......	......	......	......	......	10.5
	1 30 0 „	......	......	......	......	......	......	......	......	16.2						
(12)	1 30 15 „	......	......	......	......	16.0	13.1	2.9	−9.2							
	1 30 30 „	......	......	......	......	......	......	......	......	......	17.0	13.2	3.8	−15.7		
(13)	1 32 0 „	15.38	30.0	......	17,590	15.0	12.1	2.9	−10.3	15.5						
(14)	1 34 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	−5.5
	1 35 0 „	14.651	28.0	14.90	18,890											
	1 36 0 „	14.553	......	14.80	19,068											
	1 37 0 „	14.553	27.0	......	19,068	......	......	......	......	15.6	15.5	11.3	4.2	−21.1		
	1 37 10 „	......	......	......	......	15.0	11.1	3.9	−18.1							
	1 37 20 „	......	......	......	......	......	......	......	......	15.8	......	......	......	......	− 8.0	
	1 37 30 „	14.469	......	14.80	19,222											
	1 37 40 „	......	......	14.40												
(15)	1 37 50 „	......	......	......	......	14.5	10.2	4.3	−13.0	......	......	......	......	......	−10.0	
	1 38 0 „	......	......	......	......	......	......	......	......	......	14.2	10.5	3.7	−18.1		
	1 38 10 „	......	......	......	......	13.2	10.0	3.2	−14.8	12.9						
	1 38 20 „	14.947	30.5	......	19,960											
	1 38 25 „	......	......	14.28	20,126											
(16)	1 38 30 „	13.947														
	1 38 35 „															
	1 38 40 „	......	......	14.00												
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Misty. (2) In cloud, wholly obscured. (3) Lighter. (4) Much lighter, still in cloud. (5) Gun heard. (6) Dense cloud. (7) Out of cloud. (8) Tried Camera upon beautiful clouds—failed; the balloon was spirating and ascendin[…] too quickly.

(9) Deep blue sky. (10) The ice not properly formed on Wet-bulb Thermometer. (11) Earth visible in patches. (12) The Wet-bulb reads correctly. (13) Ozone: Moffat 2; Moffat 2; Schönbein 0. (14) Mr. Coxwell pants for breath. (15) Mercury of Daniell's Hygrometer invisible. (16) Ozone: Moffat 3; Moffat second paper 3; Schönbein 1.

TABLE I.—Meteorological Observations made in Ei… Balloon Ascents. Wolverhampton, September 5, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 1.	Height above sea-level.	Dry and Wet Th… …nometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	1 38 50 p.m.	……	……	……	……	……	……	……	……	8·0						
(1)	1 39 0 „	13·76	……	……	20,393	8·0	4·5	3·5	−22·7	8·5						
	1 40 0 „	……	……	……	……	……	……	……	……	9·2	……	……	……	……	− 9·0	
	1 40 15 „	……	……	……	……	10·2	8·1	2·1	− 8·2	……	……	……	……	……	……	−15·0
(2)	1 40 30 „	……	……	……	……	……	……	……	……	11·0	9·5	7·8	1·7	− 5·3		
	1 41 20 „	13·35	26·0	……	21,182	……	……	……	……	……	……	……	……	……	……	−15·0
	1 41 30 „	……	……	……	……	……	……	……	……	……	……	……	……	……	……	−20·0
(3)	1 41 40 „															
(4)	1 41 50 „	……	……	……	……	……	……	……	……	4·5						
(5)	1 44 0 „	12·754	……	……	22,380	8·1	4·2	3·9	−26·0							
(6)	1 45 0 „	……	……	……	……	……	……	……	……	……	7·3	4·5	2·8	−17·3		
(7)	1 48 0 „	11·954	25·0	……	23,976	0·0	−4·0	4·0	−35·2	……	……	……	……	……	……	no dew. −30·0
	1 50 0 „	11·254	……	……	25,382	……	……	……	……	− 2·0						
(8)	1 51 0 „	10·803	……	……	26,350	−5·0	……	……	……	− 5·0						
	1 53 ± „	9·753	……	……	29,000											
	2 7 0 „	……	……	11·53	25,318	−2·0	……	……	……	− 2·0						
	2 8 0 „	12·354	……	……	23,021											
	2 8 30 „	12·554	……	12·80	22,654	……	……	……	……	+ 2·0						
	2 8 45 „	13·154	26·0	……	21,650	……	……	……	……	11·0						
	2 9 0 „	14·054	……	……	20,018	17·0	11·0	6·0	−34·7							
	2 9 30 „	16·374	……	16·45	16,015	……	……	……	……	18·0						
	2 9 40 „	17·074	……	……	14,938											
	2 10 0 „	……	……	……	……	22·5	15·8	6·7	−27·0							
	2 11 0 „	17·71	……	……	14,012											
	2 12 30 „	……	……	……	……	……	……	……	……	23·2						
	2 14 0 „	18·05	……	……	13,520	……	……	……	……	24·5						
	2 14 30 „	……	……	……	……	……	……	……	……	……	24 8	18·0	6·8	−19·6		
(9)	2 15 0 „	18·455	……	……	12,900											
	2 16 0 „	……	……	19·10	12,250	26·5	18·2	8·3	−22·4							
(10)	2 16 10 „	19·753	……	19·90	11,150											
	2 16 20 „	20·053	……	20·25	10,780											
(11)	2 16 50 „	20·653	27·0	20·65	10,070	31·1	23·1	8·0	+ 2·5	31·1						
	2 17 30 „	21·151	……	21·55	9,370											
	2 18 0 „	……	……	……	……	33·0	25·0	8·0	9·3							
	2 19 0 „	……	……	……	……	34·2	25·9	8·3	11·3							
	2 19 30 „	21·845	31·0	21·90	8,530											
	2 20 0 „	……	……	……	……	35·2	27·0	8·2	13·9	35·2						
	2 20 20 „	22·041	33·0	……	8,310											
(12)	2 20 30 „	……	……	……	……	……	……	……	……	……	……	……	……	……	14·0	
(13)	2 20 40 „	22·241	33·0	22·20	8,090	40·1	29·2	11·9	15·2							
	2 21 30 „															
(14)	2 22 0 „	……	……	……	……	42·2	31·0	11·2	17·3							
	2 22 10 „	……	……	……	……	……	……	……	……	40·0						
(15)	2 23 20 „	22·637	35·0	22·76	7,625	42·0	……	……	……	……	……	……	……	……	……	20·0
	2 23 30 „	……	……	……	……	……	……	……	……	40·0						
	2 23 50 „	22·932	37·0	23·20	7,260	……	……	……	……	40·0						
	2 24 0 „	23·028	39·0	23·00	7,150											
	2 25 0 „	23·326	40·0	……	6,810	42·0										
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15	16.

(1) Sand out. (2) Aspirator difficult to work.
(3) Ozone: Moffat 4. (4) See with difficulty.
(5) Experienced a difficulty in reading the instruments. (6) Aspirator troublesome.
(7) Sand out. (8) Lost myself; could not see to read the instrum…
(9) Ozone: Moffat 5; Moffat second paper 5; Schönbein 2.

(10) Wind East. (11) Gun heard. (12) Sand out.
(13) Wet-bulb seems to be free from ice.
(14) After this observation I pressed the bulb of Wet Thermometer between my thumb and …nger, for the purpose of melting any ice remaining on it, or on the connecting-thread.
(15) Ozone: Moffat's test 6.

Table I.—Meteorological Observations made in Eight Balloon Ascents. Wolverhampton, September 5, 1862.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 1.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	2 26 0 p.m.	23·473	41·5	......	6,640											
	2 26 10 „	......	......	......	......	42·0	......	......	......	41·5						
(1)	2 26 15 „	......	......	......	......	45·2	34·2	11·3	21·5							
	2 27 0 „															
	2 29 0 „	......	......	......	......	......	......	......	......	45·5	......	......	......	......	......	27·0
	2 29 30 „	24·512	46·0	......	5,500	49·2	36·0	13·2	21·8							
(2)	2 30 30 „	......	......	......	......	......	......	......	......	......	47·1	44·1	3·0	40·7	29·5	
	2 31 0 „	......	......	......	......	49·0	......	......	......	47·0						
	2 31 30 „	......	......	......	......	49·2	35·0	14·2	19·7							
	2 32 0 „	25·401	50·0	25·55	4,521	......	......	......	......	48·0						
	2 32 30 „	......	......	......	......	50·5	36·0	14·5	20·8							
	2 33 0 „	25·800	50·0	......	4,110											
	2 33 30 „	......	......	......	......	51·1	37·0	14·1	22·3							
	2 36 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	37·5
	2 38 0 „	26·399	50·0	26·35	3,484	53·0	45·0	8·0	37·0	51·5						
	2 38 10 „	......	......	......	......	......	......	......	......	53·0	53·5					
(3)	2 38 20 „															
	2 39 0 „	27·598	50·0	......	2,260											
	2 39 20 „	......	......	......	......	54·0	48·0	6·0	42·1	54·0						
	2 39 40 „	......	......	28·10												
	3 6 0 „	......	......	29·02	......	57·2	52·8	4·4	48·8	57·5						
	Crystal Palace, September 8, 1862.															
(4)	4 47 0 p.m.	29·90	......	29·92	250	67·2	63·0	4·2	61·2							
(5)	4 48 0 „	29·40	......	29·47	813	66·5	63·1	3·4	60·4							
(6)	4 49 0 „	28·90	......	28·80	1,232	63·2	60·5	2·7	58·2							
(7)	4 50 0 „	28·70	......	28·50	1,530	63·1	60·2	2·9	57·8							
(8)	4 50 30 „	28·50	......	28·30	1,730	62·8	59·8	3·0	57·2							
(9)	4 51 0 „	27·75	......	27·59	2,432	60·2	57·2	3·0	54·6							
	4 52 0 „	27·55	......	27·40	2,520	58·8	56·5	2·3	54·4							
(10)	4 52 30 „	27·20	......	27·10	2,923	56·5	54·2	2·3	52·1							
(11)	4 53 0 „	26·90	......	26·70	3,320	55·2	52·5	2·7	49·9							
	4 54 0 „	26·52	......	26·30	3,720	54·0	51·2	2·8	48·5							
(12)	4 54 30 „	26·05	......	25·90	4,169	52·0	50·5	1·5	49·0							
(13)	4 55 0 „	25·86	......	25·68	4,380	51·5	50·5	1·0	49·5							
(14)	4 55 30 „															
	4 56 0 „	25·56	......	25·50	4,560	51·0	49·8	1·2	48·6							
(15)	4 56 10 „															
(16)	4 56 30 „	25·46	......	25·41	4,650	50·5	49·8	0·7	49·1							
	4 57 0 „	25·45	......	25·38	4,727	50·5	50·0	0·5	49·5							
	4 57 30 „	25·43	......	25·38	4,727	50·8	49·8	1·0	48·8							
(17)	4 58 20 „	25·44	......	25·36	4,750	51·1	49·8	1·3	48·6							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Wet-bulb seems to be correct; it has decreased from the reading I drove it to by the action of the heat of my thumb and finger.
(2) I do not think Aspirated Wet-bulb is correct. (3) Ozone: Moffat's paper 7.
(4) At $4^h\ 47^m\ 15^s$ eased up; at $4^h\ 47^m\ 28^s$ let go catch.
(5) At $4^h\ 48^m\ 15^s$ over the lake.
(6) Gas clear; at $4^h\ 49^m\ 55^s$ scud at lower elevation, not under us.
(7) Thames seen clearly; ships seen. (8) Sand out.
(9) Gas getting cloudy; just see netting; smell of gas.
(10) Gas cloudy. (11) Heard shouting below.
(12) Mist; dense fog; gas cloudy; netting invisible.
(13) In a dense white cloud; can just see the earth.
(14) Earth not visible.
(15) In cloud, thick and white; dropped a piece of paper, visible 23 seconds.
(16) Gas still cloudy. (17) Half out of cloud; blue sky above.

TABLE I.—Meteorological Observations made in Eight Balloon Ascents. Crystal Palace, September 8, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Dry and Wet Thermometers (aspirated). Wet.	Dry and Wet Thermometers (aspirated). Diff.	Dry and Wet Thermometers (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	4 58 40 p.m.	25·44	......	25·36	4,750	50·5	49·8	0·7	49·1							
(1)	4 59 0 „	25·50	......	25·42	4,690	50·3	49·2	1·1	48·0							
(2)	4 59 10 „															
	4 59 30 „	......	......	25·50	4,610	49·5	48·7	0·8	47·9							
	4 59 45 „	25·80	......	25·55	4,560	49·3	48·5	0·8	47·7							
(3)	5 0 0 „	25·84	......	25·60	4,510	49·5	48·2	1·3	46·8							
(4)	5 0 30 „															
	5 1 0 „	26·04	......	25·73	4,480	50·0	48·0	2·0	45·9							
(5)	5 1 30 „															
(6)	5 1 40 „															
(7)	5 1 50 „															
	5 2 0 „	......	......	25·95	4,160	49·8	49·0	0·8	48·2							
	5 3 0 „	......	......	26·10	3,946	50·5	49·8	0·7	49·1							
	5 4 0 „	......	......	26·20	3,850	50·8	49·9	0·9	48·9							
(8)	5 4 30 „	......	......	26·28	3,770	51·2	50·0	1·2	48·8							
	5 5 0 „	26·55	......	26·38	3,670	51·5	50·8	0·7	50·1							
	5 5 30 „	26·76	......	26·70	3,350	52·2	51·1	1·1	50·0							
	5 6 0 „	26·81	......	26·74	3,310	52·5	51·5	1·0	50·5							
	5 6 30 „	26·86	......	26·78	3,270	53·0	51·5	1·5	50·0							
(9)	5 7 0 „	......	......	26·68	3,370	53·5	51·5	2·0	49·5							
	5 7 30 „	26·63	......	26·25	3,808	53·5	51·5	2·0	49·6							
(10)	5 9 10 „															
	5 10 0 „	......	......	26·10	3,958	52·5	51·5	1·0	50·5							
(11)	5 10 30 „	......	......	25·95	4,108	52·2	51·5	0·7	50·8							
(12)	5 10 40 „															
	5 11 0 „	26·85	......	25·74	4,220	51·5	50·0	1·5	48·5							
(13)	5 11 15 „															
(14)	5 11 20 „															
(15)	5 11 25 „															
	5 11 30 „	26·66	......	25·52	4,440	51·0	49·8	1·2	48·8							
(16)	5 11 55 „															
(17)	5 12 0 „	25·40	......	25·40	4,540	51·0	46·1	5·0	40·8							
	5 12 15 „	......	......	25·22	4,895	51·0	44·1	6·9	36·9							
(18)	5 12 30 „	......	......	25·20	4,920	51·1	44·2	6·9	37·0							
	5 13 0 „	25·10	......	25·20	4,920	52·1	43·8	8·3	35·4							
	5 14 0 „	......	......	25·20	4,920	53·2	44·1	9·1	34·9							
(19)	5 14 40 „															
	5 15 0 „	......	......	25·19	4,930	54·2	44·1	10·1	34·2							
	5 15 30 „	24·96	......	25·11	5,026	55·2	44·1	11·1	33·5							
(20)	5 15 35 „															
	5 16 0 „	......	......	25·00	5,175	56·5	45·1	11·4	34·5							
(21)	5 16 30 „															
(22)	5 16 45 „															
(23)	5 17 0 „	24·76	......	24·92	5,263	57·2	46·1	11·1	35·9							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Still partly in cloud.
(2) Cloud more dense; descending.
(3) See the roads on the earth.
(4) Can see the earth as through a fine mist.
(5) A misty view; horizon obscured all round.
(6) Can see Blackheath, the Royal Observatory, Woolwich, and the Crystal Palace.
(7) Very black clouds over London.
(8) Mouth of the Thames visible.
(9) Shouting below; dropped a piece of paper, visible for $2^m 45^s$. A beautiful break in the clouds in the west.
(10) Over woods.
(11) Shooters Hill visible.
(12) In slight mist.
(13) Just see the earth.
(14) Earth invisible.
(15) Blue sky in zenith, clouds below; came out of cloud in a hollow or basin.
(16) Image of balloon with beautiful prismatic colours on the clouds.
(17) Sun shining; clear blue sky.
(18) Deep blue sky; beautiful reflexion of the balloon, with primary and secondary prismatic rings.
(19) Sun warm; clouds heaped upon others; we are not much higher than level of top of [clouds]
(20) Gas rather cloudy; see netting pretty well.
(21) Earth seen through the clouds.
(22) Fluffy clouds.
(23) Ring cut the spectral balloon about one-third from top.

TABLE I.—Meteorological Observations made in Eight Balloon Ascents. Crystal Palace, September 8, 1862.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	5 17 30 p.m.	......	......	24·95	5,230	57·2	47·2	10·0	38·0	......	......	......	......	......	42·0	
(2)	5 17 55 „															
(3)	5 18 30 „	......	......	24·78	5,428	58·5	49·0	9·5	40·5							
	5 19 0 „	25·10	......	24·82	5,388	60·0	49·5	10·5	40·3							
(4)	5 20 30 „	......	......	25·05	5,112	58·2										
(5)	5 20 55 „															
	5 21 0 „	......	......	25·05	5,109	57·5	46·2	11·3	35·9							
	5 21 10 „	25·36	......	25·02	5,145	57·5	46·2	11·3	35·9							
(6)	5 21 20 „	......	......	25·00	5,169	57·5	46·2	11·3	35·9							
(7)	5 21 50 „															
(8)	5 22 0 „	25·03	......	25·08	5,057	56·2	47·0	9·2	38·4							
	5 22 40 „	25·30	......	25·09	5,043	54·2	47·8	6·4	41·6							
(9)	5 22 45 „															
(10)	5 23 50 „	......	......	25·10	5,029	51·8	48·0	3·8	44·2							
	5 24 0 „	......	......	25·11	5,019	51·5	48·2	3·3	44·9							
(11)	5 24 10 „															
(12)	5 24 30 „	25·32	......	25·09	5,039	51·5	48·2	3·3	44·9							
	5 25 0 „	......	......	25·30	4,829	51·2	48·5	2·7	45·7							
(13)	5 25 20 „															
	5 25 30 „	25·70	......	25·50	4,629	51·2	49·5	1·7	47·7							
(14)	5 25 55 „															
(15)	5 26 0 „	......	......	25·92	4,137	51·2	49·8	1·4	48·4							
	5 26 20 „	......	......	26·69	3,328	52·0	49·5	2·5	47·0							
(16)	5 26 25 „															
(17)	5 27 0 „	......	......	26·80	3,218	52·2	49·5	2·7	46·8							
	5 27 30 „	26·64	......	26·40	3,618	52·5	49·5	3·0	46·5							
(18)	5 27 55 „															
	5 28 0 „	26·65	......	26·58	3,438	53·5	51·5	2·0	49·5							
(19)	5 28 8 „															
	5 29 30 „	27·34	......	27·06	2,954	54·5	52·0	2·5	45·5							
(20)	5 29 55 „															
(21)	5 30 15 „															
(22)	5 30 25 „															
	5 30 30 „	27·50	......	27·25	2,783	55·0	52·5	2·5	50·1							
	5 31 0 „	......	......	27·52	2,540	55·5	53·2	2·3	51·2							
	5 31 30 „	......	......	27·60	2,432	55·5	54·2	1·3	53·0							
	5 31 45 „	......	......	27·68	2,360	56·0	54·8	1·2	53·7							
	5 32 0 „	28·17	......	27·82	2,207	56·2	55·1	1·1	54·1							
(23)	5 32 5 „															
	5 32 30 „	......	......	27·95	2,090	56·2	55·1	1·1	54·1							
	5 33 0 „	......	......	28·05	1,990	56·8	55·5	1·3	54·3							
	5 33 15 „	28·44	......	28·17	1,870	57·2	55·9	1·3	54·7							
	5 33 30 „	......	......	28·30	1,720	57·2	56·0	1·2	54·9							
	5 34 0 „	......	......	28·40	1,620	57·2	56·2	1·0	55·3							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Clouds rising, were whiter than those below; a slight amount of blue in all clouds.
(2) Balloon approaching clouds.
(3) Rings encircling the whole spectral balloon; there were three distinct rings round the balloon and car.
(4) Clouds near us like smoke.
(5) Rings just encircled the spectral car. (6) Cold to senses.
(7) Rings just cut off top of the spectral balloon; beautiful chasm in the clouds.
(8) Entering cloud. (9) Just entering cloud, blue sky above.
(10) Gas escaping out of balloon; sun visible; train heard; dog barking.

(11) Just in cloud again.
(12) In cloud, sky bluish above; hear sounds below; white mist.
(13) In cloud; gas very clear. (14) Fields visible on the earth.
(15) Shouting. (16) Cumulus scud below us.
(17) Saw embankment of London and Chatham Railway.
(18) A fine white cloud seemed to be resting on the Thames; Crystal Palace visible.
(19) Over Jorden's Wood, near Bexley. (20) Over ploughed fields.
(21) Gun and shouting heard. (22) Gravesend and the Nore in sight.
(23) Near Dartford.

Table I.—Meteorological Observations made in Eight Balloon Ascents. Crystal Palace, September 8, 1862.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	5 35 0 p.m.															
(1)	5 35 30 „	......	......	28·49	1,530	58·2	57·0	1·2	55·8							
(2)	5 35 40 „	28·74	......	28·60	1,420	58·5	57·5	1·0	56·6	......	......	......	......	......	55·0	
	5 36 0 „															
(3)	5 36 20 „	......	......	28·65	1,370	58·5	57·5	1·0	56·6							
(4)	5 37 0 „															
	5 37 30 „	......	......	28·80	1,220	59·0	58·5	0·5	58·0							
(5)	5 38 10 „	......	......	28·95	1,077	59·8	58·0	1·8	56·5							
	5 38 30 „															
	5 39 0 „	......	......	29·10	932	60·0	59·8	0·2	59·6							
	5 39 15 „	29·40	......	29·20	842	60·2	59·8	0·4	59 5							
	5 39 30 „	......	......	29·25	805	60·5	59·5	1·0	58·6							
	5 40 0 „	29·42	......	29·30	768	60·5	59·8	0·7	59·2							
(6)	5 40 15 „	29·40	......	29·28	782	61·0	60·5	0·5	60·1							
(7)	5 40 20 „															
	5 40 25 „															
	5 40 30 „															
	5 41 0 „	......	......	29·20	842	61·5	61·0	0·5	60·6							
(8)	5 41 45 „	29·36	......	29·18	856	61·1	61·0	0·1	61·0							
	5 42 0 „															
	5 43 0 „	......	......	29·15	887	61·1	60·5	0·6	59·9							
	5 44 0 „	29·35	......	29·15	887	61·1	60·5	0·6	59·9	......	......	......	......	......	58·5	
	5 44 30 „	29·40	......	29·15	887	61·1	60·5	0·6	59·9							
	5 45 0 „	......	......	29·20	842	61·1	60·0	1·1	59·0							
	5 45 30 „	29·40	......	29·22	827	61·5	60·0	1·5	58·7							
	5 46 0 „	29·45	......	29·25	805	61·7	60·0	1·7	58·5							
	5 47 0 „	29·38	......	29·20	842	62·0	60·0	2·0	58·3							
	5 48 0 „	......	......	29·18	856	61·5	60·0	1·5	58·7							
	5 48 30 „	......	......	29·15	887	61·5	60·0	1·5	58·7							
(9)	5 48 45 „	......	......	29·15	887	61·2	59·8	1·4	58·6							
	5 49 0 „															
	5 49 10 „	......	......	29·14	896	61·2	60·0	1·2	58·9							
(10)	5 49 20 „	......	......	29·18	856	61·2	59·8	1·4	58·6							
	5 50 0 „															
	5 50 30 „	......	......	29·18	856	61·1	60·0	1·1	59·0							
	5 51 0 „	29·40	......	29·21	826	61·1	59·8	1·3	58·6							
	5 52 0 „	......	......	29·28	772	61·1	59·8	1·3	58·6							
(11)	5 52 15 „	......	......	29·38	672	61·5	60·0	1·5	58·7							
(12)	5 53 25 „															
	5 54 0 „															
	5 54 30 „	......	......	29·50	553	61·5	60·0	1·5	58·7							
(13)	5 54 45 „	29·62	......	29·54	517	62·0	60·5	1·5	59·2							
(14)	5 55 0 „	......	......	29·46	589	62·0	60·5	1·5	59·2							
	5 55 10 „	29·25	......	29·12	895	62·2	60·5	1·7	59·0							
	5 56 0 „	......	......	29 00	1,040	62·2	60·5	1·7	59·0							
	5 56 10 „	29·11	......	28·90	1,130	61·8	60·0	1·8	58·5							
(15)	5 56 15 „	......	......	......	......	61·5	59·8	1·7	58·2							
	5 56 40 „	28·65	......	28·50	1,520	61·1	58·9	2·2	57·0							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) North Kent train, eight carriages. (2) Flock of sheep, like large specks.
(3) Nearly over Small Wood.
(4) Could plainly see people waving handkerchiefs.
(5) Over very large wood. (6) Still over same wood.
(7) Crystal Palace still in sight. (8) See dog, and hear him barking and people shouting.

(9) Over North Kent Railway. (10) Near large limeworks.
(11) Gas clear; over Swanscomb Marsh. (12) Bank of river Thames.
(13) People on steamboats energetic.
(14) Crossed the river in 2^{m} 1^{s} from bank to bank to the W. of Gravesend.
(15) Over London and Southend Railway.

Table I.—Meteorological Observations made in Eight Balloon Ascents. Crystal Palace, September 8, 1862.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	5 56 55 p.m.															
	5 57 0 "	......	......	28·40	1,628	60·8	58·2	2·6	56·0							
	5 57 30 "	......	......	28·38	1,639	60·5	58·0	2·5	55·8							
	5 58 0 "	28·40	......	28·22	1,798	60·0	58·0	2·0	56·2							
(2)	5 58 15 "															
	5 58 40 "	......	......	......	......	60·0	58·2	1·8	56·6							
	5 59 0 "	......	......	28·11	1,907											
(3)	6 0 0 "	28·37	......	28·05	1,967	60·5	58·1	2·4	56·0							
	6 0 4 "															
	6 0 10 "	......	......	27·98	2,034	60·0	58·5	1·5	57·1	......	......	......	......	......	56·5	
	6 0 20 "	28·18	......	27·98	2,034	60·0	57·8	2·2	55·8							
	6 1 0 "	......	......	27·98	2,034	59·8	57·2	2·6	54·9							
	6 1 30 "	......	......	27·90	2,114	59·8	57·5	2·3	54·8							
	6 1 45 "	......	......	27·90	2,114	59·8	57·2	2·6	54·9							
	6 2 0 "	......	......	27·78	2,235	59·5	57·1	2·4	50·0							
(4)	6 3 4 "															
(5)	6 3 25 "															
(6)	6 4 15 "															
	6 5 0 "	......	......	27·89	2,122	59·2	57·0	2·2	55·0							
(7)	6 6 0 "															
(8)	6 10 0 "	......	......	30·07												
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Over meadows opposite Rosherville Gardens; gas clear.
(2) Tilbury Fort examined with a telescope.
(3) Over Mucking Flats.
(4) Let gas out.
(5) Over meadows.
(6) Descending.
(7) Packed the instruments up.
(8) Down in Mucking Flats, about 2½ miles from Stanford le Hope, and 4 miles from Tilbury Fort.

§ 4. Adopted Temperatures of the Air and Dew-point, with Height, in the eight Balloon Ascents.

From all the observations of the temperature of the air and of the dew-point in the preceding Tables, a determination was made of both elements with the corresponding readings of the barometer and heights. Some of the numbers in the column for heights have been interpolated when either of these elements have been observed without a corresponding observation of the barometer. The numbers thus found are within brackets. The results are contained in the following Tables.

Table II.—Showing the adopted Reading of the Barometer, calculated Height above the Sea, Temperature of the Air, and Temperature of the Dew-point in eight Balloon Ascents.

First Ascent.—July 17.

Time of observation. A.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.	Time of observation. A.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
h m	in.	feet.	°	°	h m	in.	feet.	°	°
9 42	29·19	490	59·0	51·4	10 39	14·63	19380	36·5	21·6
47	26·01	3835	45·0	35·3	44	14·63	19336	34·0	21·3
49	25·22	4467	43·0	32·0	47	14·13	20238	31·5	14·6
51	24·14	5802	34·8	32·1	48	....	(20512)	31·0	
53	22·42	7980	32·5	....	50	13·64	21059	23·8	−12·5
54	20·02	8065	31·8	27·8	54	13·14	21792	19·0	− 8·2
55	21·58	8809	29·8	21·8	57	12·14	23949	17·5	− 4·5
56	20·93	9598	26·2	17·6	11 0	11·74	24746	16·0	− 8·0
58	19·63	11312	26·0	24·5	1	11·14	26177	16·0	− 9·0
10 2	19·28	11792	26·0	24·4	3	11·64	25022	16·0	− 8·5
3	18·63	12709	26·0	20·8	5	11·64	25028	17·5	
4	....	(13088)	26·2	19·9	7	11·64	25077	18·0	
5	18·14	13467	28·0	23·7	12	11·95	24547	23·7	
8	17·24	14544	31·0	23·8	20	12·65	23868	27·0	
11	16·74	15704	31·6	22·7	25	13·14	22337	27·2	
15	16·04	16914	32·0	22·7	37	16·36	16282	29·7	9·4
25	14·94	18844	37·2	24·6	38	18·94	12376	34·2	7·4
27	14·64	19374	36·1	23·1	39	20·04	10539	37·0	
29	14·64	19415	38·2	21·8	40	20·54	9882	37·8	19·8
30	14·64	19415	38·1	20·2	44	23·44	6330		
35	14·64	19485	42·2	19·5	45	24·24	5432		

Between $10^h\ 50^m$ and $11^h\ 25^m$ in the last column, the numbers entered with the sign — before them imply that the temperature of either Daniell's or Regnault's hygrometer had been lowered to the degree stated, but that no dew was deposited, and therefore that the temperature of the dew-point was at a still lower degree.

At $10^h\ 50^m$ the readings of the Dry and Wet (free) were 24°·5 and 17°·2, giving a dew-point temperature of —26°·6.

At $10^h\ 50^m$ the readings of the Dry and Wet (aspirated) were 23°·0 and 17°·0, giving a dew-point temperature of —20°·6.

At $10^h\ 54^m$ the readings of the Dry and Wet (free) were 19°·2 and 11°·2, giving a dew-point temperature of —47°·5.

At $10^h\ 57^m$ the readings of the Dry and Wet (free) were 16°·5 and 9°·5, giving a dew-point temperature of —44°·1; and the readings of the Dry and Wet (aspirated) were 18°·5 and 8°·0, giving a dew-point temperature of —69°·9.

At $11^h\ 7^m$ the readings of the Dry and Wet (free) were 19°·0 and 9°·0, giving a dew-point temperature of —67°·4; and the readings of the Dry and Wet (aspirated) were 18°·2 and 12°·0, giving a dew-point temperature of —34°·5.

At $11^h\ 25^m$ the readings of the Dry and Wet (free) were 28°·1 and 17°·5, giving a dew-point temperature of —26°·1.

From the general agreement of the results observed by Daniell's Hygrometer to —10°, by Regnault's Hygrometer to this and lower temperatures, and those of the dew-point as found by the Dry- and Wet-bulb thermometers, there can be no doubt that the temperature of the dew-point at heights exceeding 25,000 feet must have been at least as low as —50°.

Second Ascent.—July 30.

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	h m s	in.	feet.	°	°
4 36	29·96	250	68·2	50·0	5 18	24·93	5220	49·3	37·3
40	29·96	250	68·0	49·7	20 30	24·78	5370	48·2	37·3
40 30	29·87	330	67·2	48·0	21	24·79	5360	48·5	37·2
40 45	29·82	370	66·5	47·9	22	24·95	5200	49·8	38·9
41	29·80	390	66·5	47·9	23 30	24·95	5200	48·5	37·2
41 15	29·65	480	66·0	47·9	24	24·82	5330	50·0	38·7
41 30	29·55	570	65·5	47·3	24 30	24·70	5450	47·5	35·9
42	29·50	615	65·2	45·1	26	24·62	5830	47·8	35·8
42 30	29·20	890	63·8	44·9	28 30	24·32	5530	48·0	35·4
43	28·85	1189	62·0	43·2	31	24·47	5380	48·5	36·2
43 30	28·65	1389	62·0	43·0	31 30	24·57	5280	48·2	38·4
44 30	28·20	1829	59·8	43·5	38 30	24·30	5903	43·5	35·8
45 30	27·65	2379	58·5	42·6	39	24·22	5983	43·5	35·8
47 30	27·10	2452	54·2	41·9	40 30	24·02	6183	43·5	35·8
48 30	26·87	3161	52·5	41·4	41	....	(6220)	44·1	34·0
49	26·50	3543	51·0	39·8	43	23·83	6370	44·2	32·7
50	26·40	3640	50·4	40·4	44	24·00	6252	45·2	35·1
50 30	26·35	3690	49·8	41·0	45 30	24·42	6785	46·5	35·9
52	26·27	3770	50·0	39·7	47	24·60	5577	46·0	36·4
52 30	26·25	3790	50·6	40·7	48	24·53	5649	45·2	35·1
53 30	26·18	3860	51·0	40·0	50	24·35	5846	44·2	34·7
54	26·12	3920	52·2	39·7	52	24·12	6102	43·0	33·1
54 30	26·08	3960	52·5	39·4	54	23·82	6466	46·0	34·3
56	25·91	4169	51·5	40·3	55	23·69	6642	46·5	33·8
56 45	25·80	4279	50·0	39·7	57	23·58	6752	47·2	35·2
57 30	25·73	4358	50·5	39·2	57 30	23·50	6826	43·5	31·4
59	25·78	4308	50·5	39·2	58	23·47	6856	43·1	32·6
59 30	25·85	4234	51·5	40·3	58 30	23·43	6896	43·5	31·4
5 0	25·90	4184	51·8	40·1	59	....	(6910)	43·9	29·8
0 30	26·00	4084	51·8	40·1	6 0	23·40	6937	42·5	30·3
1	....	(4094)	51·5	39·9	1	23·47	6867	41·0	32·0
1 30	25·98	4104	52·1	40·2	2	23·79	6547	41·5	31·4
3	25·76	4324	51·5	40·7	6	....	(6603)	45·6	31·6
4 30	25·68	4403	52·1	39·8	7	....	(6617)	45·2	32·9
7 30	25·47	4613	49·2	36·5	7 30	....	(6625)	45·0	32·4
8	25·30	4783	49·0	36·7	8 30	23·70	6637	45·0	31·3
9 30	25·40	4682	48·5	38·1	10 30	23·59	6747	44·8	29·0
10	25·35	4733	48·9	37·7	11 30	23·40	6937	44·2	31·8
11 30	25·20	4925	48·2	37·5	13	23·42	6917	44·2	31·8
12	25·20	4920	48·5	37·2	14	....	(6819)	44·5	30·8
14	25·26	4863	48·2	37·3	15	23·63	6720	44·5	32·4
16	25·25	4873	48·2	38·0	17	....	(6505)	45·5	32·5
16 30	25·20	4920	47·9	37·6	18	23·95	6400	45·2	32·7
17 30	25·00	5155	49·3	36·2	18 30	24·35	6000	46·4	32·8

Second Ascent.—July 30 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
h m s	in.	feet.	°	°
6 19	24·55	5800	46·0	34·3
19 30	24·60	5750	46·2	36·2
20	24·95	5400	47·0	35·4
21	25·40	4950	47·5	37·0
22	25·90	4450	47·8	38·8
22 30	....	(4160)	49·0	38·6

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
h m s	in.	feet.	°	°
6 23	26·48	3870	49·2	39·5
24	26·60	3750	50·1	41·7
25	27·65	2700	55·5	42·2
25 30	....	(2400)	58·3	41·7
30	29·96	on the ground	68·0	47·4

Third Ascent.—August 18.

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
0 53 0	29·34	490		
56 0	29·34	490	67·8	54·6
1 5 0	28·84	1130	62·5	52·5
6 0	28·55	1419	60·0	
6 20	28·25	1713	58·2	53·1
6 30	....	(1795)	57·2	
7 0	27·90	2042	55·5	50·5
8 0	26·67	3347		
8 20	....	(3466)	52·5	
9 0	26·27	3705	50·0	49·6
10 0	25·86	4138	49·9	
10 25	....	(4440)	49·8	44·2
11 0	25·30	4767	48·8	42·2
11 30	....	(5140)	48·6	
12 0	24·60	5509	48·2	
12 30	24·60	5510	47·8	38·8
13 20	....	(6155)	48·0	37·7
14 0	23·64	6585	46·5	
15 0	22·69	7706	45·7	
17 0	21·69	8935	44·0	32·0
18 45	20·90	9954	43·0	29·6
18 55	....	(10129)	40·5	28·6
20 0	19·90	11267	38·5	
20 5	....	(11285)	37·2	24·9
20 35	19·80	11399	36·0	24·8
21 0	19·75	11470	39·5	22·2
22 0	20·30	10840	41·8	25·2
24 0	20·90	9884	45·0	26·9
24 5	....	(9884)	45·0	
24 15	20·90	9884	..	
24 50	21·38	9120	46·2	32·0
25 0	....	(9040)	45·8	
25 10	....	(8960)	47·2	33·1
26 0	....	(8575)	..	28·2
26 30	22·21	8342	..	30·5
27 0	22·62	7836	51·0	37·9
32 0	22·80	7650	49·2	37·0
33 0	22·80	7650	53·8	36·6
34 0	....	(7265)	..	36·0
37 30	24·25	5919	..	
38 0	24·46	5820	53·8	37·8
41 0	25·08	5028	53·5	
41 30	25·56	4530	..	43·5
43 0	25·58	4480	..	46·0
46 0	26·56	3438	..	47·5
48 0	26·76	3219	56·0	
52 0	25·79	4233	55·0	

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
1 52 30	25·59	4448		
53 0	....	(4562)	52·2	40·0
55 0	25·08	5019	51·0	42·0
56 0	....	(5273)	..	39·5
57 40	....	(5695)	50·0	40·9
58 0	24·39	5780		
58 30	....	(5913)	54·8	
58 40	....	(5958)	..	40·1
2 0 0	23·93	6313		
1 0	23·78	6491		
1 30	....	(6580)	54·0	41·7
9 0	22·58	7886	50·5	38·6
10 0	....	(8342)	..	37·5
10 30	22·18	8571	51·0	39·8
11 0	....	(8660)	51·0	38·4
11 40	21·88	8771	51·0	37·6
11 50	....	(8771)	..	39·0
12 0	....	(8771)	..	39·0
12 20	....	(8771)	..	39·5
13 0	21·88	8771		
13 40	....	(9327)	50·5	
13 50	....	(9715)	..	34·9
14 0	20·99	9902	50·0	
15 0	21·14	9695	50·5	34·1
15 30	....	(9987)	48·1	
17 0	20·24	10864	..	29·3
20 0	19·60	11748	..	21·2
21 0	19·11	12364	39·2	25·6
22 0	....	(12595)	38·5	
22 30	18·86	12708		
23 0	18·71	12942	38·0	
24 0	18·11	13852	34·1	
25 0	....	(14290)	..	23·4
25 20	17·61	14434	..	23·1
29 0	16·41	16339	27·8	6·0
31 0	....	(16885)		
32 0	15·93	17157		
32 10	....	(17240)	..	± 5·0
32 20	15·84	17321	28·1	
32 30	....	(17380)		
34 0	....	(17770)	30·5	5·0 no dew
34 20	....	(17860)	..	3·5 no dew
35 0	....	(18039)	31·5	1·2
36 10	....	(18445)	27·5	− 5·0
36 20	....	(18505)	28·0	

Third Ascent.—August 18 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
h m s	in.	feet.	°	°
2 36 30	15·03	18560		
36 40	....	(18605)	24·8	− 2·0
36 50	....	(18650)	25·5	
37 55	....	(18935)		
38 10	14·87	19000		
38 30	....	(19200)	..	− 5·0
38 40	....	(19290)	28·5	
39 0	14·62	19461		
39 10	....	(19604)		
39 20	....	(19800)	26·1	
39 30	....	(20000)	25·5	
42 0	....	(20350)	..	− 8·5
42 10	14·12	20359	25·1	
45 0	....	(20665)	..	− 5·0
....	....	(20888)	23·5	
49 0	13·62	21111		
49 50	....	(21200)	25·4	−10·0
59 0	12·83	23164	..	−12·0
59 10	12·71	23215	24·2	
59 20	12·61	23377	..	− 8·0
59 40	12·93	22705	24·0	−10·0
3 0 0	13·13	22295		
3 20	13·13	22295	24·5	− 9·0
....	....	(22295)	24·8	−10·0
4 30	13·13	22295	24·0	− 9·0
5 0	12·93	22705	24·1	
5 30	....	(22705)	..	−10·0
6 10	....	(22705)	24·0	
7 0	12·93	22705	24·0	− 8·0

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
h m s	in.	feet.	°	°
3 12 30	12·93	22705	24·0	
13 0	....	(22160)	..	− 9·0
13 13	13·63	21977	24·0	
13 20	....	(22000)	..	−10·0
13 30	....	(22004)	24·0	
13 40	13·58	22008	24·0	
18 30	13·45	22107	24·0	
19 20	....	(21757)	..	−10·0
19 30	....	(21685)	24·0	
19 40	....	(21615)	25·0	
19 40	....	(21610)	24·8	
32 0	....	(16405)	..	0·0
33 0	16·78	15984		
34 0	17·53	13320	32·8	11·1
36 0	18·63	12453	38·0	13·3
39 0	20·02	10624	40·7	14·4
40 0	20·72	10224	45·5	14·4
41 30	21·62	8764		
43 0	22·77	8144		
43 10	....	(7910)	50·5	36·7
43 30	22·74	7438		
45 0	....	(6943)	..	38·6
47 0	....	(6282)	..	40·0
49 0	24·28	5621	50·0	
50 20	25·08	4821	52·1	43·9
51 0	25·36	4521	51·5	44·8
53 0	....	(3900)	51·0	48·9
4 5 0	....	on the ground	67·0	

Fourth Ascent.—August 20.

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
6 5 0	29·86	250	67·8	56·7
26 0	29·86	250	66·2	55·9
27 0	29·85	250	66·0	56·0
28 30	29·66	430	65·2	54·8
29 0	29·62	450	64·6	54·3
29 30	29·48	530	64·2	53·7
29 40	29·40	602	64·1	53·3
29 50	29·33	662	63·5	52·5
30 0	29·28	707	63·2	52·7
31 0	28·95	1037	63·0	52·3
32 30	28·55	1397	61·5	51·7
33 0	28·45	1497	61·5	51·3
34 0	28·00	1912	58·5	50·5
35 0	27·75	2160	57·5	49·1
35 30	27·65	2257	56·2	50·0
36 0	27·40	2408	56·0	49·2
37 0	....	(2665)	55·2	49·1
37 10	27·20	2709	55·1	49·0
37 30	26·95	2959	54·2	48·8
38 0	26·75	3159	53·1	48·9
39 0	26·55	3359	52·8	48·2
41 0	26·12	3816	51·1	46·6
41 30	25·95	3986	50·5	46·4
42 0	25·82	4116	51·0	45·9

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
6 43 0	25·68	4256	50·0	45·5
43 30	25·60	4316	51·0	45·3
47 0	25·55	4366	50·5	43·7
48 0	25·60	4316	50·0	43·8
49 0	25·75	4116	49·2	45·7
49 30	25·80	4055	50·5	46·4
50 0	26·05	3893	51·5	44·9
51 30	26·25	3693	51·5	44·9
52 0	26·35	3593	51·5	44·9
55 0	26·28	3663	51·2	45·1
56 0	26·25	3693	50·9	45·4
57 30	26·20	3743	50·3	45·2
58 0	26·15	3793	49·8	44·4
7 0 0	26·11	3833	50·2	44·7
1 20	26·08	3863	49·8	44·4
2 0	26·05	3893	49·5	44·7
4 0	25·85	4052	48·2	44·7
5 0	25·70	4250	48·0	43·8
7 0	25·58	4384	47·0	43·0
8 0	25·60	4354	47·2	43·7
9 0	25·68	4278	48·1	43·9
10 0	25·50	3405	48·2	44·7
12 0	26·20	3621	49·8	43·0
13 0	26·45	3468	51·0	45·3

FOURTH ASCENT.—August 20 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	h m s	in.	feet.	°	°
7 15 0	27·50	2398	53·5	48·5	7 29 30	27·70	2217	55·9	50·1
16 0	27·70	2198	54·2	48·9	30 0	27·58	2417	55·5	50·2
16 30	28·03	1871	54·8	49·3	32 0	....	(2620)	55·2	51·3
17 0	28·25	1655	55·5	49·6	33 0	27·18	2723	54·2	48·8
18 0	28·50	1417	56·5	50·1	34 0	27·18	2723	54·8	49·3
19 0	28·53	1387	57·0	50·3	35 0	27·22	2683	55·2	47·9
19 10	28·55	1367	57·0	50·3	36 0	27·30	2603	54·8	48·5
19 30	28·63	1287	57·2	51·3	37 0	....	(2670)	54·2	48·8
20 0	28·64	1277	57·5	51·2	40 0	27·03	2873	53·5	46·1
20 30	28·62	1297	57·5	51·2	41 0	26·80	3003	53·0	46·0
22 0	28·33	1587	57·8	51·0	42 0	26·10	3703	51·2	44·7
23 0	28·25	1667	57·2	51·4	47 0	24·82	5194	45·0	41·8
24 0	28·01	1907	56·8	50·5	48 0	24·90	5106	45·0	41·8
25 0	27·85	2067	56·8	50·5	49 0	24·18	5900	43·0	
25 20	27·75	2167	56·2	50·2	52 0	24·88	5200	43·3	
26 0	27·70	2217	56·5	50·1	55 0	24·88	5200	44·2	
26 30	27·70	2217	56·5	50·7	56 0	24·92	5160	44·2	
28 0	27·78	2297	56·8	50·1					

FIFTH ASCENT.—August 21.

A.M.					A.M.				
4 30 0	....	320	60·8	58·4	5 20 0	19·70	11222	29·8	
31 0	29·59	358	60·0	57·2	21 0	19·45	11616	27·8	
33 0	29·58	367	58·9	57·2	22 0	19·09	12254	25·5	
35 0	29·45	490	59·2	58·9	23 0	18·90	12421	23·2	
36 0	29·20	728	59·0	59·0	24 0	18·90	12421	23·3	
39 0	28·78	1130	57·8	52·2	26 0	....	12851	23·5	
40 0	28·70	1210	57·5	51·2	27 0	18·42	13080	24·0	
41 0	28·62	1286	57·2	50·6	29 0	18·20	13381	24·0	−7·1
42 0	28·58	1326	56·8	51·0	29 30	18·15	13456	23·5	−9·8
44 0	28·18	1706	55·5	51·2	30 30	18·00	13665	25·0	−6·3
45 0	27·90	2000	55·0	51·1	31 0	17·90	13680	22·2	−23·4
49 0	26·95	2930	52·2	47·4	32 30	17·82	13799	19·5	−29·4
51 0	26·40	3510	49·8	44·4	34 0	17·78	13875	19·5	−23·4
52 0	25·95	3951	47·0	41·0	34 30	17·78	13875	19·3	−39·4
53 0	25·78	4138	46·5	40·7	35 0	17·70	14027	19·5	−30·6
55 0	25·05	4927	43·8	41·5	36 0	17·72	13989	19·9	−36·2
55 30	24·72	5260	43·2	41·0	36 30	17·71	14008	20·0	−22·6
56 0	....	(5357)	42·0	40·2	37 0	17·70	14027	20·5	−21·5
57 0	24·45	5557	40·2	39·8	38 0	17·65	14121	21·5	−19·5
57 30	24·05	5989	39·7	39·7	38 30	17·62	14178	22·5	−22·1
5 0 0	23·58	6510	38·5	36·0	40 0	17·68	14064	24·0	−17·5
3 0	23·75	6336	40·7	32·3	42 0	17·68	14068	24·8	−17·5
4 0	23·68	6413	41·5	31·8	43 0	17·62	14178	24·8	−3·2
5 0	23·20	6967	40·5	32·5	44 0	17·62	14178	25·2	−4·4
7 0	23·15	7027	40·5	30·9	44 30	17·62	14178	26·5	−14·4
8 0	23·10	7087	41·0	29·2	45 0	17·58	14254	26·5	−13·2
10 0	22·48	7810	37·5	25·5	45 45	17·58	14254	26·3	−12·4
11 0	22·10	8281	37·2	24·7	46 0	17·58	14254	27·2	−12·4
12 0	22·00	8406	35·0	23·3	46 15	17·58	14254	27·2	−12·4
14 0	21·65	8841	35·2	21·2	47 0	17·56	14335	27·6	−13·1
15 0	21·40	9150	34·8	20·2	48 0	17·57	14273	26·0	−7·4
15 30	21·10	9525	33·0	18·6	48 30	17·58	14254	25·5	
16 0	20·65	10085	32·8	12·4	50 0	17·57	14273	25·5	−15·4
17 0	20·45	10335	31·9	10·1	50 45	17·58	14254	25·1	−15·3
18 0	20·30	10472	31·0	14·3	51 0	17·56	14318	25·2	−21·8

FIFTH ASCENT.—August 21 (*continued*).

Time of observation. A.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.	Time of observation. A.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	h m s	in.	feet.	°	°
5 52 0	17·60	14258	24·1	−12·5	6 24 0	22·23	8040	43·0	21·0
55 0	17·62	14228	23·8	−19·7	25 0	22·65	7655	42·8	20·1
56 0	17·62	14228	23·8	−17·7	25 30	22·72	7573	43·5	20·5
56 30	17·62	14228	23·0	−17·0	27 0	22·95	7293	44·5	19·6
57 0	17·62	14228	23·1	−20·5	27 30	23·08	7141	44·2	22·0
57 30	17·61	14243	22·5	−17·6	28 0	23·12	7094	43·0	25·8
58 0	17·60	14258	23·0	−24·3	28 30	23·11	7106	42·8	27·8
59 30	17·62	14228	23·4	−25·6	29 0	23·20	7001	43·0	30·2
59 30	17·62	14228	23·4	−27·5	30 0	23·30	6884	43·0	33·1
6 0 0	17·63	14213	23·5	−27·4	31 0	23·28	6907	42·0	38·7
1 0	17·70	14108	24·2	−29·0	31 30	23·40	6767	42·5	39·2
2 0	17·90	13802	24·5	−29·4	32 0	23·50	6650	42·0	38·7
2 30	17·95	13715	24·2	−17·0	32 15	23·60	6533	42·0	38·7
3 0	18·10	13484	23·8	−26·7	33 0	24·00	6058	41·5	37·7
4 0	18·11	13479	24·2	−19·0	33 30	24·22	5819	41·8	37·3
4 30	18·15	13419	24·2	−17·7	33 30	24·50	5515	41·5	37·7
5 30	18·23	13299	25·2	−17·3	34 0	24·70	5298	42·2	37·9
6 0	18·30	13194	25·2	−11·2	35 0	24·80	5189	43·5	38·0
6 15	18·35	13119	25·2	−13·1	36 0	24·90	5080	44·2	37·5
8 0	....	(12815)	24·5	−13·8	36 30	24·92	5058	43·8	39·2
12 0	19·07	12174	30·0	5·1	37 0	25·10	4851	45·2	37·2
12 20	19·11	12122	29·8	1·6	37 30	25·20	4745	45·0	38·9
13 0	19·15	12070	27·8	1·8	37 45	25·30	4639	45·0	38·9
13 30	19·28	11901	27·5	−12·6	38 0	25·60	4320	46·0	40·0
14 0	19·30	11875	27·8	−5·4	38 30	25·92	3980	46·8	40·8
14 30	19·30	11875	27·5	−10·7	39 0	26·15	3751	47·8	41·6
15 0	19·30	11875	27·8	−4·4	40 0	26·40	3502	48·2	42·6
16 0	19·65	11420	31·5	4·5	41 0	26·60	3300	49·5	44·7
17 0	19·80	11225	32·0	8·8	42 0	26·80	3186	50·0	45·5
18 0	20·05	10871	33·8	17·3	42 15	27·00	2872	51·0	45·3
18 15	20·20	10688	34·5	14·7	43 0	27·20	2673	51·5	44·8
18 30	20·30	10566	36·5	16·0	44 0	27·70	2177	53·5	46·7
19 0	20·80	9936	37·0	18·1	45 0	27·98	1898	54·5	48·0
20 0	21·00	9650	37·0	18·7	45 30	28·20	1684	55·5	48·6
22 0	21·70	8810	41·5	18·0	46 0	28·40	1489	56·0	47·8
23 30	22·20	8196	43·5	18·7	7 10 0	29·42	513	61·8	51·1

SIXTH ASCENT.—September 1.

P.M.					P.M.				
4 5 0	29·78	250	63·0	57·3	5 5 30	26·46	3408	49·2	40·1
40 0	29·78	250	63·8	56·5	6 30	26·41	3458	49·5	39·8
45 0	29·78	250	65·0	55·5	8 0	26·41	3458	49·5	38·5
52 0	....	270	64·0	56·3	9 0	26·50	3368	49·8	38·2
53 0	29·65	320	63·0	51·9	10 0	26·55	3318	50·0	39·3
53 20	29·20	720	61·1	52·5	10 30	26·51	3358	50·0	39·3
53 40	28·90	996	59·2	50·3	11 30	26·31	3560	50·0	39·3
54 0	28·55	1332	57·2	51·2	13 0	26·19	3680	48·8	37·8
54 30	28·00	1868	55·2	47·8	15 0	26·19	3680	49·2	38·6
55 0	27·65	2214	54·2	48·1	16 0	26·25	3620	49·2	38·4
57 0	27·21	2654	52·2	46·7	17 0	26·29	3580	49·2	38·6
58 30	26·92	2940	51·5	44·0	19 0	26·28	3590	48·8	37·0
59 0	26·91	2950	50·5	43·7	20 0	26·29	3583	47·8	37·3
5 1 0	26·78	3080	50·0	42·8	23 0	25·95	3937	47·2	38·3
1 30	26·69	3170	50·0	42·8	23 30	25·91	3977	47·2	36·4
3 0	26·61	3257	49·5	43·3	24 0	25·90	3987	47·0	36·6
4 0	26·60	3268	49·2	42·6	25 0	25·90	3987	47·2	37·2

SIXTH ASCENT.—September 1 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	h m s	in.	feet.	°	°
5 26 0	26·05	3837	48·1	36·4	5 56 0	27·55	2290	51·0	47·3
26 30	26·15	3737	48·2	38·4	57 0	27·65	2190	51·2	47·1
27 0	26·20	3687	48·5	38·0	57+	....	(2040)	52·0	49·0
28 0	26·10	3787	47·8	36·6	58 0	27·95	1890	52·0	49·0
29 0	26·00	3887	47·2	36·4	58 10	28·05	1790	52·5	47·5
30 0	25·88	4000	47·2	36·3	58 30	28·12	....	53·2	47·8
31 0	25·75	4090	47·2	36·4	59 0	28·22	1620	53·2	47·8
32 0	25·70	4180	46·2	36·1	59 30	28·30	1540	53·8	48·3
33 0	25·69	4190	46·2	36·1	6 0 0	28·45	1417	54·0	48·1
35 0	25·69	4190	46·1	36·0	0 30	28·52	1347	54·2	48·3
37 0	25·98	3900	47·2	37·9	2 0	28·30	1567	54·0	49·0
37 30	26·19	3690	47·2	37·2	3 0	28·19	1677	54·0	49·0
40 0	26·50	3362	47·5	38·4	3 30	28·05	1817	54·0	49·0
42 0	26·82	3040	48·5	39·6	4 0	27·81	2057	54·2	48·9
43 0	26·95	2910	49·2	41·6	5 0	27·75	3117	53·5	49·5
44 0	26·95	2910	49·8	42·2	5 30	27·75	3117	53·5	49·5
45 0	26·88	2970	49·2	42·8	6 0	27·75	3117	54·2	48·9
48 0	26·68	3170	48·2	40·4	6 15	27·79	3077	54·2	48·9
50 0	26·90	2950	49·2	39·5	6 30	27·80	3067	53·5	49·5
52 0	27·49	2356	50·0	42·8	8 0	27·90	2967	53·5	49·5
53 0	27·40	2446	50·5	43·7	8 30	28·00	2867	53·5	49·5
53 30	27·40	2446	50·5	45·0	9 0	28·20	2667	54·5	49·2
54 0	27·44	2406	50·0	45·9					

SEVENTH ASCENT.—September 5.

P.M.					P.M.				
0 0 0	....	490	59·5	48·4	1 30 15	....	(16965)	16·0	
1 5 0	29·17	720	59·0	50·5	30 30	....	(17055)	16·0	
5 20	28·97	909	57·2	50·1	32 0	15·40	17590	15·5	
5 50	....	(1340)	56·5	47·9	34 0	....	(18180)	....	− 5·5
6 0	28·38	1480	55·5	46·9	37 0	14·55	19068	15·6	−21·1
10 0	26·19	3660	45·5	41·5	37 20	....	(19290)	15·8	− 8·0
11 0	....	4116	44·2	40·4	38 0	....	(19735)	14·2	
11 30	25·49	4388	43·3	38·9	38 10	....	(19847)	12·9	
12 0	24·99	4920	42·0	38·7	38 20	14·05	19960		
12 30	24·89	5011	40·9	38·3	38 25	13·95	20126		
13 0	24·30	5675	39·5	36·5	38 50	....	(20315)	8·0	− 5·0
13 30	24·25	5722	38·0	36·1	39 0	13·76	20393	8·5	
14 30	23·70	6330	36·5	36·5	40 0	....	(20733)	9·2	− 9·0
16 0	23·36	6729			40 15	....	(20818)	....	−15·0
16 30	....	(6821)	36·1	36·1	40 30	....	(20903)	11·0	
17 0	23·21	6914	36·0	35·7	41 20	13·35	21182	....	−15·0
17 20	....	(7245)	..	33·3	41 50	....	(21407)	4·5	
17 40	22·66	7575	39·5	30·2	44 0	12·75	22380		
21 0	20·72	9926	32·1	26·6	48 0	11·95	23976	0·0	−30·0
22 0	20·07	10770	31·2	26·9	50 0	11·25	25382	− 2·0	no dew
24 0	18·73	12568	26·5	19·7	51 0	10·80	26350		
25 30	17·93	(13875)	25·5	22·3	53±	9·75	29000	− 5·0	
26 0	....	(14312)	23·2		2 7 0	....	25318	− 2·0	
27 0	16·94	15184			8 30	12·55	22654	+ 2·0	
27 30	....	(15347)	18·7		8 45	13·15	21650	11·0	
28 0	16·69	15510	18·0		9 0	14·05	20018	17·0	
28 30	....	(16015)	17·9		9 30	16·37	16015	18·0	
29 0	16·05	16520	17·9		9 40	17·07	14938		
29 20	....	(16640)	17·8	10·5	10 0	....	(14706)	22·5	
30 0	....	(16875)	16·2		11 0	17·71	14012		

SEVENTH ASCENT.—September 5 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	h m s	in.	feet.	°	°
2 14 0	18·06	13520	24·5		2 26 10	....	(6590)		
14 30	....	(13210)	24·8		26 15	....	(6560)	45·2	21·5
15 0	18·46	12900	..	0·0	29 0	....	(5655)	45·5	27·0
16 0	....	12250	26·5		29 30	24·51	5500	47·0	21·8
16 50	20·65	10070	31·1		30 30	....	(5110)	47·1	35·1
19 0	....	(8800)	34·2		31 30	....	(4720)	49·2	19·7
19 30	21·85	8530			32 0	25·40	4521	48·0	
20 0	....	(8400)	35·2		32 30	....	(4315)	50·5	20·8
20 20	22·04	8310			33 0	25·80	4110		
20 40	22·24	8090	40·1	15·2	33 30	....	(4050)	51·1	22·3
22 0	....	(7860)	42·2	17·3	36 0	....	(3735)	....	37·5
23 20	22·64	7625	40·0	20·0	38 0	26·40	3484	52·2	37·0
23 50	22·93	7260	40·0		39 0	27·60	2260		
24 0	23·03	7150			39 20	....	....	54·0	42·1
25 0	23·35	6810	42·0		3 6 0	....	on the ground	57·2	48·8
26 0	23·47	6640							

The reading of Regnault's hygrometer at $1^h 45^m$ was reduced to −30°, without any deposition of moisture; the temperature of the dew-point was therefore at a lower degree. At $1^h 48^m$ the temperature of the dew-point, as determined by the Dry- and Wet-bulb thermometers, was −35°, as shown below.

At $1^h 37^m$ the readings of the Dry and Wet thermometers (aspirated) were 15°·5 and 11°·3, giving a dew-point temperature of −21°·1.

At $1^h 37^m 10^s$ the readings of the Dry and Wet thermometers (free) were 15°·0 and 11°·1, giving a dew-point temperature of −18°·1.

At $1^h 37^m 50^s$ the readings of the Dry and Wet thermometers (free) were 14°·5 and 10°·2, giving a dew-point temperature of −13°·0.

At $1^h 38^m$ the readings of the Dry and Wet thermometers (aspirated) were 14°·2 and 10°·5, giving a dew-point temperature of −18°·1.

At $1^h 38^m 10^s$ the readings of the Dry and Wet thermometers (free) were 13°·2 and 10°·0, giving a dew-point temperature of −14°·8.

At $1^h 39^m$ the readings of the Dry and Wet thermometers (free) were 8°·0 and 4°·5, giving a dew-point temperature of −22°·7.

At $1^h 40^m 15^s$ the readings of the Dry and Wet thermometers (free) were 10°·2 and 8°·1, giving a dew-point temperature of −8°·2.

At $1^h 40^m 30^s$ the readings of the Dry and Wet thermometers (aspirated) were 9°·5 and 7°·8, giving a dew-point temperature of −5°·3.

At $1^h 44^m$ the readings of the Dry and Wet thermometers (free) were 8°·1 and 4°·2, giving a dew-point temperature of −26°·0.

At $1^h 45^m$ the readings of the Dry and Wet thermometers (aspirated) were 7°·3 and 4°·5, giving a dew-point temperature of −17°·3.

At $1^h 48^m$ the readings of the Dry and Wet thermometers (free) were 0°·0 and −4°·0, giving a dew-point temperature of −35°·2.

At $2^h 9^m$ the readings of the Dry and Wet thermometers (free) were 17°·0 and 11°·0, giving a dew-point temperature of −34°·7.

At $2^h 10^m$ the readings of the Dry and Wet thermometers (free) were 22°·5 and 15°·8, giving a dew-point temperature of −27°·0.

From the general agreement of the results as observed by Regnault's hygrometer and those of the dew-point as found by the Dry- and Wet-bulb thermometers, there can be no doubt that the temperature of the dew-point at heights exceeding 30,000 feet must have been as low as −50°.

EIGHTH ASCENT.—September 8.

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	h m s	in.	feet.	°	°
4 47 0	29·92	250	67·2	61·2	5 24 30	25·09	5039	51·5	44·9
48 0	29·47	813	66·5	60·4	25 0	25·30	4829	51·2	45·7
49 0	28·90	1232	63·2	58·2	25 30	25·50	4629	51·2	47·7
50 0	28·70	1530	63·1	57·8	26 0	25·92	4137	51·2	48·4
50 30	28·50	1730	62·8	57·2	26 20	26·69	3328	52·0	47·0
51 0	27·75	2432	60·2	54·6	27 0	26·80	3218	52·2	46·8
52 0	27·55	2520	58·8	54·4	27 30	....	3618	52·5	46·5
52 30	27·20	2923	56·5	52·1	28 0	....	3438	53·5	49·5
53 0	26·70	3320	55·2	49·9	29 30	27·06	2954	54·5	45·5
54 0	26·30	3720	54·0	48·5	30 30	27·25	2783	55·0	50·1
54 30	25·90	4169	52·0	49·0	31 0	27·52	2540	55·5	51·2
55 0	25·68	4380	51·5	49·5	31 30	27·60	2432	55·5	53·0
56 0	25·50	4560	51·0	48·6	31 45	27·68	2360	56·0	53·7
56 30	25·41	4650	50·5	49·1	32 0	27·82	2207	56·2	54·1
57 0	25·38	4727	50·5	49·5	32 30	27·95	2090	56·2	54·1
57 30	25·38	4727	50·8	48·8	33 0	28·05	1990	56·8	54·3
58 20	25·36	4750	51·1	48·6	33 15	28·17	1870	57·2	54·7
58 40	25·36	4750	50·5	49·1	33 30	28·30	1720	57·2	54·9
59 0	25·42	4690	50·3	48·0	34 0	28·40	1620	57·2	55·3
59 30	25·50	4610	49·5	47·9	35 0	28·49	1530	57·2	55·8
59 45	25·55	4560	49·3	47·7	35 30	28·60	1420	58·5	56·6
5 0 0	25·60	4510	49·5	46·8	36 0	28·65	1370	58·5	56·6
1 0	25·73	4480	50·0	45·9	36 20				
2 0	25·95	4160	49·8	48·2	37 0	28·80	1220	59·0	58·0
3 0	26·10	3946	50·5	49·1	37 30	28·95	1077	59·8	56·5
4 0	26·20	3850	50·8	48·9	38 30	29·10	932	60·0	59·6
4 30	26·28	3770	51·2	48·8	39 0	29·20	842	60·2	59·5
5 0	26·38	3670	51·5	50·1	39 15	29·25	805	60·5	58·6
5 30	26·70	3350	52·2	50·0	39 30	29·30	768	60·5	59·2
6 0	26·74	3310	52·5	50·5	40 0	29·28	782	61·0	60·1
6 30	26·78	3270	53·0	50·0	40 30	29·20	842	61·5	60·6
7 0	26·68	3370	53·5	49·5	41 0	29·18	856	61·1	61·0
7 30	26·25	3808	53·5	49·6	42 0	29·15	887	61·1	59·9
10 0	26·10	3958	52·5	50·5	43 0	29·15	887	61·1	59·9
10 30	25·95	4108	52·2	50·8	44 0	29·15	887	61·1	59·9
11 0	25·74	4220	51·5	48·5	44 30	29·20	842	61·1	59·0
11 30	25·52	4440	51·0	48·8	45 0	29·21	827	61·5	58·7
12 0	25·40	4540	51·0	40·8	45 30	....	805	61·7	58·5
12 15	25·22	4895	51·0	36·9	46 0	....	842	62·0	58·3
12 30	25·20	4920	51·1	37·0	47 0	29·18	856	61·5	58·7
13 0	25·20	4920	51·1	35·4	48 0	29·15	887	61·5	58·7
14 0	25·20	4920	53·2	34·9	48 30	29·15	887	61·2	58·6
15 0	25·19	4930	54·2	34·2	49 0	29·14	896	61·2	58·9
15 30	25·11	4926	55·2	33·5	49 10	29·18	856	61·2	58·6
16 0	25·00	5175	56·5	34·5	50 0	29·18	856	61·1	59·0
17 0	24·92	5263	57·2	35·9	50 30	29·21	826	61·1	58·6
17 30	24·95	5230	57·2	38·0	51 0	29·28	772	61·1	58·6
18 30	24·78	5428	58·5	40·5	52 0	29·38	672	61·5	58·7
19 0	24·82	5388	60·0	40·3	54 0	29·50	553	61·5	58·7
20 30	25·05	5112	58·2		54 30	29·54	517	62·0	59·2
21 0	25·05	5109	57·5	35·9	54 45	29·46	589	62·0	59·2
21 10	25·02	5145	57·5	35·9	55 0	29·12	895	62·2	59·0
21 20	25·00	5169	57·5	35·9	55 10	29·00	1040	62·2	59·0
22 0	25·08	5057	56·2	38·4	56 0	28·90	1130	61·8	58·5
22 40	25·09	5043	54·2	41·6	56 10	....	(1230)	61·5	58·2
23 50	25·10	5029	51·8	44·2	56 40	28·50	1520	61·1	57·0
24 0	25·11	5019	51·5	44·9	57 0	28·40	1628	60·8	56·0

EIGHTH ASCENT.—September 8 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	h m s	in.	feet.	°	°
5 57 30	28·38	1639	60·5	55·8	6 1 30	27·98	2034	59·8	54·9
58 0	28·22	1798	60·0	56·2	1 45	27·90	2114	59·8	54·8
58 40	28·11	(1870)	60·0	56·6	2 0	27·90	2114	59·8	54·9
6 0 0	28·05	1967	60·5	56·0	3 40	27·78	2235	59·5	50·0
0 20	27·98	2034	60·0	57·1	5 0	27·89	2122	59·2	55·0
1 0	27·98	2034	60·0	55·8	10 0	30·07	on the ground		

§ 5. VARIATION OF TEMPERATURE OF THE AIR WITH HEIGHT.

In order to arrive at an approximate value of the normal variation of temperature on each day, it is necessary to make some estimate of the amount of the disturbing causes.

For this purpose I placed every reading of temperature in the preceding Tables in the high ascents, or the means of small groups of observations in the low ascents, on diagrams, and joined all the points, and caused a curve to pass through or near them, so that every change of temperature was thus made evident to the eye.

In all these projected curves there were parts of evidently the same curve showing a gradual decrease of temperature with increase of elevation, and a gradual increase with decrease of elevation. These parts were connected and assumed to be a close approximation to the truth, and capable of giving approximate values of the normal variation of temperature with height. The departure in the projected curve of observed temperatures from the assumed curve of normal temperatures in these diagrams indicated the places and the amounts of disturbance. The next step was the reading from these curves the temperature at every thousand feet, and in this way the next Tables were formed. The numbers in the first column show the height in feet, beginning at 0 feet and increasing upwards; the numbers in the second column show the interval of time in ascending to the highest point; the notes in the third column show the circumstances of the observations; the numbers in the fourth and fifth columns the observations and the approximate normal temperature of the air; and those in the next column the difference between the two preceding columns, or the most probable effect of the presence of cloud or mist on the temperature, or of other disturbing causes in operation.

The next group of columns are arranged similarly for the descent, and the other groups for succeeding ascents and descents.

TABLE III.—Showing the Temperature of the Air, as read off the curve drawn through the observed temperatures, and as read off the curve of most probable normal temperature, called adopted temperature, and the calculated amount of disturbance from the assumed law of decrease of temperature.

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
July 17.										
26000	From $9^h\ 43^m$ a.m. to $11^h\ 1^m$ a.m.	Above cloud.	16·0°	16·0°	0·0°	From $11^h\ 2^m$ a.m. to $11^h\ 50^m$ a.m.	Above cloud.	16·0°	16·0°	0·0°
25000			16·0	16·0	0·0			18·0	17·2	+ 0·8
24000			16·8	16·0	+ 0·8			26·0	18·5	7·5
23000			17·9	16·1	1·8			27·9	19·8	8·1
22000			19·5	16·2	3·3			28·1	21·0	7·1
21000			24·1	16·8	7·3			28·5	22·5	6·0
20000			32·1	17·0	15·1			28·6	23·9	4·7
19000			39·5	17·3	22·2			28·8	25·0	3·8
18000			35·2	17·8	17·4			29·0	26·2	2·8
17000			32·7	18·0	14·7			29·2	27·8	1·4
16000			31·9	18·5	13·4			29·5	29·0	+ 0·5
15000			31·2	19·5	12·7			30·5	30·5	0·0
14000			29·5	20·1	9·4			31·5	31·5	0·0
13000			26·7	21·5	5·2			33·0	33·0	0·0
12000			25·9	22·3	3·6		In cloud.	34·5	34·5	0·0
11000			26·0	24·0	2·0			36·0	36·0	0·0
10000			26·2	26·0	0·2			37·5	37·5	0·0
9000			29·0	29·0	0·0					
8000		In cloud.	32·0	32·0	0·0					
7000			36·5	36·5	0·0					
6000			34·8	41·0	6·2					
5000			39·3	45·2	5·9					
4000		Under cloud.	43·5	50·0	6·5					
3000			47·9	54·8	9·1					
2000			52·5	59·8	7·3					
1000			56·9	64·1	7·2					
0			61·5	70·0	+ 8·5					

July 17.—The departure in this ascent from a regular progression is very remarkable. Below the cloud the decrease of temperature was pretty well uniform; on passing out of it there was an increase of 6°, and then the decrease was resumed. At 10,000 feet the temperature was 26°, and there was no change in the next 3000 feet; then a very remarkable increase took place, till at 19,500 feet with a temperature of 42° the rise was checked, and then declined rapidly to 16° at 5 miles high. In the descent a disturbance from the regular increase of temperature was met with at the height of 24,000 feet, and continued to 17,000 feet; at 13,000 feet clouds were reached, and no observations were taken below 10,000 feet.

The dense clouds which covered the earth caused an apparent loss of temperature of about 8½°; and the effect of a warm current of air, which was first met with at the height of 11,000 feet, amounted, at 19,500 feet, to fully 25° warmer than would have been had this intermediate current of warm air not existed. The excess of warmth is shown at the different elevations of 1000 feet in the 6th column of the Table for this day.

TABLE III. (*continued.*)

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
July 30.										
7000	From $4^h\ 36^m$ to $5^h\ 43^m$ p.m.	Misty.	..°	42·8°	..°	From $5^h\ 44^m$ to $6^h\ 30^m$ p.m.	..	44·0°	44·0°	0·0°
6000			43·5	45·5	− 2·0		..	46·0	46·0	0·0
5000			48·2	48·2	0·0		..	47·4	47·4	0·0
4000			52·0	50·8	+ 1·2		..	49·2	49·2	0·0
3000			52·7	53·2	− 0·5		..	54·1	54·1	0·0
2000			59·5	57·0	+ 2·5		..	59·2	59·2	0·0
1000			62·9	62·9	0·0		..	63·2	63·2	0·0
0			70·7	70·7	0·0		..	68·0	68·0	0·0
August 18.										
12000	From $1^h\ 2^m$ to $1^h\ 21^m$ p.m.	The cumulus cloud extended only from 3000 to 4000 feet.	..	..	..	From $1^h\ 22^m$ to $1^h\ 48^m$ p.m.	..	..	..	..
11000			39·2	38·0	+ 1·2		..	41·2	38·0	+ 3·2
10000			41·8	39·5	2·3		..	44·5	40·0	4·5
9000			44·0	40·8	3·2		..	46·5	46·8	4·7
8000			45·2	42·0	3·2		..	50·0	44·0	6·0
7000			46·1	43·8	2·3		..	54·0	46·0	4·0
6000			47·2	45·0	2·2		..	53·5	48·0	5·5
5000			48·5	46·5	2·0		..	52·7	51·0	1·7
4000			49·9	49·2	+ 0·7		..	54·1	53·5	+ 0·6
3000			52·8	52·8	0·0		..	56·0	56·0	0·0
2000			57·5	57·5	0·0		..			
1000			62·9	62·9	0·0		..			
0			70·9	70·9	0·0		..			

On descending, a warm current of air was entered at the height of 24,000 feet, and extended downwards to 16,000 or 17,000 feet, and the calculated effect of this is shown in the 11th or last column on July 17, on the opposite page.

July 30.—There were alternately warm and cold currents at different elevations, as the balloon passed down the valley of the Thames; the departure from the curved line which was made to pass through the observed readings when laid on a large diagram, at times was from 1° to 3° in excess, and at other times nearly as much in defect; but in the descent, which was rather rapid, there were no disturbing causes in operation. The amounts of disturbance in the ascent will be seen at each 1000 feet in the preceding Table.

On August 18 the temperature of the air decreased as usual on leaving the earth, until at the height of 4000 feet the rapidity of the decrease was arrested, and a warm current of air met with, which continued till the height of 11,500 feet was reached, when the balloon turned to descend, when the same warm current was passed, extending to the same limits; and was met with again on the re-ascension, at about the same distance from the earth, and found to extend to the height of 14,000 feet, when the regular diminution was resumed, and afterwards continued to the highest point reached: on the second descent, the same warm current of aif was again met with, and continued till clouds were reached at the height of 6500 feet, which caused another interruption in the regular increase of temperature, as is usual in entering cloud from above. The temperatures of the air at every 1000 feet, as observed, were

TABLE III. (*continued.*)

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
August 18.			°	°	°			°	°	°
23000	From $1^h\ 48^m$ to $2^h\ 59^m$ p.m.	..	24·0	24·0	0·0	From $3^h\ 0^m$ to $4^h\ 6^m$ p.m.	Above cloud.	24·0	24·0	0·0
22000		..	24·2	24·2	0·0			24·4	24·4	0·0
21000		..	24·4	24·4	0·0			25·2	25·2	0·0
20000		..	24·6	24·6	0·0			26·0	26·0	0·0
19000		..	25·7	25·0	+ 0·7			27·0	27·0	0·0
18000		..	31·0	26·0	+ 5·0			28·0	28·0	0·0
17000		..	27·2	27·2	0·0			29·0	29·0	0·0
16000		..	28·8	28·8	0·0			30·0	30·0	0·0
15000		..	30·8	30·8	0·0			31·0	31·0	0·0
14000		..	33·5	32·8	+ 0·7			32·2	32·2	0·0
13000		..	37·5	34·9	2·6			34·0	34·0	0·0
12000		..	40·5	37·0	3·5			38·5	36·5	+ 2·0
11000		..	45·0	38·9	6·1			40·0	39·2	0·8
10000		..	49·5	41·0	8·5			46·0	42·0	4·0
9000		..	50·7	43·2	7·5			48·2	44·8	3·4
8000		..	51·0	45·2	5·8			50·0	47·2	2·8
7000		..	52·8	47·8	5·0			51·0	50·5	+ 0·5
6000		..	54·7	49·8	+ 4·9		In cloud.	53·8	53·8	0·0
5000		..	52·0	52·0	0·0			56·0	56·0	0·0
4000		..	54·1	54·1	0·0			53·2	62·0	− 8·8
3000		..	56·0	56·0	0·0		Below cloud.	57·2	66·5	9·3
2000								61·0	71·6	5·6
1000								64·8	76·5	11·7
0								69·0	83·0	−14·0
August 20.										
5000	From $6^h\ 26^m$ to $6^h\ 47^m$ p.m.	In cloud.	..	..	..	From $6^h\ 49^m$ to $7^h\ 20^m$ p.m.	In cloud.			
4000			49·8	49·8	0·0					
3000		Under cloud.	53·8	53·8	0·0		Under cloud.	48·8	48·8	0·0
2000			58·0	58·0	0·0			51·6	51·6	0·0
1000		..	62·5	62·5	0·0			54·6	54·6	0·0
0		..	67·4	67·4	0·0		..	57·6	57·6	
5000	From $7^h\ 21^m$ to $8^h\ 5^m$ p.m.	In cloud.	45·6	45·6	0·0					
4000			49·2	49·2	0·0					
3000			53·2	53·2	0·0					
2000			56·8	56·8	0·0					
1000			57·6	57·6	0·0					
0										

laid down on a diagram, from which the values of the temperature at every 1000 feet, as shown in the preceding Table, with the approximate amount of the disturbance caused by the warm currents of air, were read.

August 20.—The clouds were not passed; at heights above 3500 feet the balloon ascended and descended repeatedly. In this ascent there was no marked interruption to the regular decrease of temperature with increase of height.

TABLE III. (*continued.*)

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
August 21.			°	°	°			°	°	°
14000	From $4^h\ 30^m$ to $5^h\ 51^m$ a.m.	Above cloud.	22·7	22·7	0·0	From $5^h\ 52^m$ to $7^h\ 10^m$ a.m.	Above cloud.	23·7	23·7	0·0
13000			24·0	24·0	0·0			26·0	26·0	0·0
12000			26·2	26·2	0·0			29·2	29·2	0·0
11000			29·0	29·0	0·0			32·1	32·1	0·0
10000			31·8	31·8	0·0			35·6	35·6	0·0
9000			34·3	34·3	0·0			39·1	39·1	0·0
8000			37·4	37·4	0·0			42·9	42·9	0·0
7000			41·2	41·2	0·0		In cloud.	46·5	46·5	0·0
6000		In cloud.	40·0	45·0	− 5·0			40·5	50·0	− 9·5
5000			43·5	49·0	5·5		Below cloud.	43·5	54·0	10·5
4000		Below cloud.	47·2	53·0	5·8			47·0	58·0	11·0
3000			51·0	57·1	6·3			50·1	62·6	12·5
2000			54·5	61·7	7·2			54·0	67·6	13·6
1000			58·0	66·0	8·0			58·0	73·6	15·6
0			61·8	70·0	− 8·2			62·0	79·0	−17·0
September 1.										
4000	From $4^h\ 52^m$ to $5^h\ 35^m$ p.m.	..	47·5	47·5	0·0	From $5^h\ 36^m$ to $6^h\ 2^m$ p.m.	..	46·5	46·5	0·0
3000		..	50·7	50·7	0·0		..	48·5	48·5	0·0
2000		..	54·5	54·5	0·0		..	51·5	51·5	0·0
1000		..	59·2	59·2	0·0					
0		..	65·7	65·7	0·0					
4000	From $6^h\ 3^m$ to $6^h\ 6^m$ p.m.	Clouds above and below, Rain falling from the latter on the earth.					Clouds above and below. Rain falling on balloon.			
3000			53·5	53·5	0·0			53·5	53·5	0·0
2000			54·0	54·0	0·0					
1000										
0										

August 21.—The sky was cloudy, and the decrease of temperature was nearly uniform till the clouds were reached; on passing through them the usual increase of temperature took place to the amount of about 5°; then there was no particular interruption till the height of nearly 3 miles was passed; at this elevation the balloon continued for half an hour, during which time the temperature increased 3 or 4 degrees. In the descent no marked interruption was experienced from a regular increase of temperature till the clouds were entered; on passing through them a decrease of temperature of 10° was experienced, and after this the regular increase was resumed—the same temperatures being met with at the same elevations as in the ascent. The increase of temperature therefore experienced above the clouds, as the sun rose, had not penetrated in the least degree below the clouds; therefore the effect of the presence of cloud in the descent was much larger than in the ascent, as will be seen in the Table.

September 1.—The sky was covered with cirrostratus clouds which were never reached; there was no marked interruption in the regular decrease of temperature either in the ascent or descent; at the time of the second ascent the balloon was situated between two layers of clouds, and rain was falling upon it, which had the effect of equalizing the temperature, as no change of temperature took place in ascending from 1000 feet to 3000 feet. The curves

TABLE III. (*continued.*)

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
September 5.			°	°	°			°	°	°
29000	From $1^h\ 3^m$ to $1^h\ 53^m$ p.m.	Above cloud.	− 5·3	− 5·3	0·0	From $2^h\ 7^m$ to $3^h\ 6^m$ p.m.				
28000			− 4·5	− 4·5	0·0					
27000			− 3·6	− 3·6	0·0					
26000			− 2·6	− 2·6	0·0					
25000			− 1·6	− 1·6	0·0					
24000			0·0	− 0·5	+ 0·5		..	− 2·0	− 2·0	0·0
23000			+ 2·2	+ 1·0	+ 1·2		..	− 0·9	− 0·9	0·0
22000			4·6	2·5	2·1		..	+ 1·2	+ 1·2	0·0
21000			7·2	4·5	2·7		..	8·0	3·3	+ 4·7
20000			10·0	6·5	3·5		..	14·0	5·5	8·5
19000			15·0	9·0	6·0		..	16·8	7·7	9·1
18000			15·5	11·5	4·0		..	17·5	10·0	7·5
17000			16·8	14·0	2·8		..	17·8	12·0	5·8
16000			17·5	16·5	+ 1·0		..	17·8	14·8	3·0
15000			19·5	19·5	0·0		..	18·0	17·5	+ 0·5
14000			22·0	22·0	0·0		..	20·0	20·0	0·0
13000			24·5	24·5	0·0		..	22·5	22·5	0·0
12000			27·0	27·0	0·0		..	25·0	25·0	0·0
11000			29·8	29·8	0·0		..	27·8	27·8	0·0
10000			32·2	32·2	0·0		..	30·5	30·5	0·0
9000			35·0	35·0	0·0		..	33·0	33·0	0·0
8000			38·5	38·5	0·0		..	36·1	36·1	0·0
7000			33·9	42·0	− 8·1		..	38·7	38·7	0·0
6000		Below cloud.	37·0	46·0	9·0		..	41·4	41·4	0·0
5000			40·8	50·0	9·2		..	44·5	44·5	0·0
4000			44·8	54·5	9·7		..	47·2	47·2	0·0
3000			48·9	60·0	11·1		..	50·0	50·0	0·0
2000			53·0	65·0	12·0		..	53·0	53·0	0·0
1000			57·5	70·0	12·5		..	56·0	56·0	0·0
0			62·0	77·2	−15·2		..	59·2	59·2	0·0
							..	62·6	62·6	0·0

of observed and adopted temperatures were laid down on a diagram, and the temperatures at each 1000 feet as taken from the diagram are inserted in the preceding Tables.

September 5.—In this ascent on passing out of the clouds there was an increase of 9°, and then there was no interruption in the decrease of temperature till the height of 15,500 feet was reached, when a warm current of air was entered and continued to 24,000 feet, after which the regular decrease of temperature continued to the highest point reached. On descending, the same warm current was again met with between 22,000 and 23,000 feet, and a similar interruption, but to a greater amount, was experienced till the balloon had descended to about the same height as it was reached on ascending; after this there was no further interruption in the regular increase of temperature, the sky being clear till the descent was completed. An inspection of the Table will show the locality and extent of the warm current of air and the temperature at every 1000 feet both in the ascent and descent, with the probable amount of the increase of temperature caused by the warm stratum of air, and also the probable amount of loss of heat under the clouds caused by their presence.

TABLE III. (*continued*).

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
September 8.			°	°	°			°	°	°
5000	From $4^h\ 47^m$ to $4^h\ 58^m$ p.m.	Above cloud.	50·0	50·0	0·0	From $5^h\ 0^m$ to $5^h\ 9^m$ p.m.	Above cloud.	..	51·1	
4000			52·7	52·7	0·0			..	50·3	
3000		In cloud	56·4	56·4	0·0		In cloud			
2000			61·0	61·0	0·0					
1000		Below cloud.	65·1	65·1	0·0					
0			69·0	69·0	0·0					
5000	From $5^h\ 10^m$ to $5^h\ 18^m$ p.m.	..	..	55·3	..	From $5^h\ 19^m$ to $6^h\ 10^m$ p.m.	..	..	51·4	
4000		..	..	52·5	..		..	..	51·2	
3000		..	..	..	..		..	..	53·9	
2000		..	..	..	..		..	..	56·5	
1000		..	..	..	..		..	..	60·2	
0		..	..	..	..		..	..	64·8	

September 8.—The sky was cloudy, and the decrease of temperature was nearly uniform, and there was no marked interruption in the regular decrease of temperature on descending.

The next Table has been formed by taking the difference between consecutive numbers in the preceding Tables, in each of the several ascents. The disturbances on July 17 were so great and the results so different from those on the other days of experiments, that no use has been made of the results, other than inserting them in the Table.

TABLE IV.—Showing the Decrease of Temperature in every 1000 feet of elevation up to 29,000 feet.

Height above the level of the sea.		July 17.		July 30.		August 18.				August 20.		
		State of the Sky.										
		Cloudy.		Clear.	Cloudy.	Clear.				Cloudy.		
From	To	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.
ft.	ft.	°	°	°	°	°	°	°	°	°	°	°
28000	29000	...	...	...	...	...	...	...	...	...	...	...
27000	28000	...	...	...	...	...	...	...	...	...	...	...
26000	27000	...	...	...	...	...	...	...	...	...	...	...
25000	26000	0·0	1·2	...	...	...	...	...	...	...	...	...
24000	25000	0·0	1·3	...	...	...	...	...	...	...	...	...
23000	24000	0·1	1·3	...	...	...	...	...	...	...	...	...
22000	23000	0·1	1·2	...	...	...	...	0·2	0·4	...	...	...
21000	22000	0·6	1·5	...	...	...	...	0·2	0·8	...	...	...
20000	21000	0·2	1·4	...	...	...	...	0·2	0·8	...	...	...
19000	20000	0·3	1·1	...	...	...	...	0·4	1·0	...	...	...
18000	19000	0·5	1·2	...	...	...	...	1·0	1·0	...	...	...
17000	18000	0·2	1·6	...	...	...	...	1·2	1·0	...	...	...
16000	17000	0·5	1·2	...	...	...	...	1·6	1·0	...	...	...
15000	16000	1·0	1·5	...	...	...	...	2·0	1·0	...	...	...
14000	15000	0·6	1·0	...	...	...	...	2·0	1·2	...	...	...
13000	14000	1·4	1·5	...	...	...	...	2·1	1·8	...	...	...
12000	13000	0·8	1·5	...	...	...	...	2·1	2·5	...	...	...
11000	12000	1·7	1·5	...	...	...	...	1·9	2·7	...	...	...
10000	11000	2·0	1·5	...	...	1·5	2·0	2·1	2·8	...	...	...
9000	10000	3·0	...	...	...	1·3	1·8	2·2	2·8	...	...	...
8000	9000	3·0	...	...	...	1·2	2·2	2·0	2·4	...	...	...
7000	8000	4·5	...	...	...	1·8	2·0	2·6	3·3	...	...	...
6000	7000	4·5	...	2·7	2·0	1·2	2·0	2·0	3·3	...	...	...
5000	6000	4·2	...	2·7	1·4	1·5	3·0	2·2	4·0	...	...	...
4000	5000	4·8	...	2·6	1·8	2·7	2·5	2·1	4·0	...	...	3·6
3000	4000	4·8	...	2·4	4·9	3·6	2·5	1·9	4·5	4·0	2·8	4·0
2000	3000	5·0	...	3·8	5·1	4·7	...	...	5·1	5·0	3·0	3·6
1000	2000	4·3	...	5·9	4·0	5·4	...	...	4·9	4·5	...	...
0	1000	5·9	...	7·8	4·8	8·0	...	...	6·5	4·9	...	...

Height above the level of the sea.		August 21.		September 1.		September 5.		September 8.		Mean (omitting July 17).			
		State of the Sky.											
		Cloudy.		Partially clear.	Cloudy.	Partially clear.	Cloudy.	Cloudy.		Cloudy.	Clear.	Clear.	
From	To	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	At heights less than 5000 feet.		At heights exceeding 5000 feet.	Number of experiments.
ft.	ft.	°	°	°	°	°	°	°	°	°	°	°	
28000	29000	...	...	...	...	0·8	...	...	...	...	...	0·8	1
27000	28000	...	...	...	...	0·9	...	...	...	...	...	0·9	1
26000	27000	...	...	...	...	1·0	...	...	...	...	...	1·0	1
25000	26000	...	...	...	...	1·0	...	...	...	...	...	1·0	1
24000	25000	...	...	...	...	1·1	1·1	...	...	...	...	1·1	2
23000	24000	...	...	...	...	1·5	2·1	...	...	...	...	1·3	2
22000	23000	...	...	...	...	1·5	2·1	...	...	...	...	1·0	4
21000	22000	...	...	...	...	2·0	2·2	...	...	...	...	1·3	4
20000	21000	...	...	...	...	2·0	2·2	...	...	...	...	1·3	4
19000	20000	...	...	...	...	2·5	2·3	...	...	...	...	1·5	4
18000	19000	...	...	...	...	2·5	2·0	...	...	...	...	1·8	4
17000	18000	...	...	...	...	2·5	2·8	...	...	...	...	1·8	4
16000	17000	...	...	...	...	2·5	2·7	...	...	...	...	1·9	4
15000	16000	...	...	...	...	3·0	2·5	...	...	...	...	2·1	4
14000	15000	...	...	...	...	2·5	2·5	...	...	...	...	2·1	4
13000	14000	1·3	2·3	...	...	2·5	2·5	...	...	...	...	2·2	6
12000	13000	2·2	3·2	...	...	2·5	2·8	...	...	...	...	2·5	6
11000	12000	2·8	2·9	...	...	2·8	2·7	...	...	...	...	2·6	6
10000	11000	2·8	3·5	...	...	2·4	2·5	...	...	...	...	2·6	8
9000	10000	2·5	3·5	...	...	2·8	3·1	...	...	...	...	2·6	8
8000	9000	3·1	3·8	...	...	3·5	2·6	...	...	...	...	2·6	8
7000	8000	3·8	3·6	...	...	3·5	2·7	...	...	...	...	2·7	8
6000	7000	3·8	3·5	...	...	4·0	3·5	...	...	...	...	2·8	8
5000	6000	4·0	4·0	...	...	4·0	2·7	...	...	...	...	2·8	10
4000	5000	4·0	4·0	...	...	3·5	2·8	2·7	...	3·1	2·9	...	6 & 5
3000	4000	4·1	4·6	3·2	2·0	5·5	3·0	3·7	2·7	3·7	3·4	...	10 & 7
2000	3000	4·6	5·0	3·8	3·0	5·0	3·0	4·6	3·6	4·1	4·6	...	10 & 5
1000	2000	4·3	5·4	4·7	...	5·0	3·2	4·1	3·7	4·2	5·3	...	7 & 5
0	1000	4·0	6·0	6·5	...	7·2	3·4	3·9	4·6	4·5	7·2	...	7 & 5

A glance at this Table shows that, without exception, the numbers at the lower elevations are very much larger, in all states of the sky, than those at the higher, and therefore that the changes of temperature are much larger near the earth, for equal increment of elevation, than far from it.

Also by comparing the numbers at low elevations with cloudy and clear skies, those with the former are much smaller than those with the latter, and therefore the decrease of temperature with increase of elevation is larger with a clear than with a cloudy sky.

By taking the mean of the results at every stratum of 1000 feet, omitting those belonging to July 17, we have—

THE MEAN DECREASE OF TEMPERATURE OF THE AIR

When the Sky was Cloudy,

Up to	1000 feet was	4°·5	from 7	experiments, or 1° in	222 feet.
From 1000 to 2000	,,	4°·2	,, 7	,, ,, ,,	239 feet.
From 2000 to 3000	,,	4°·1	,, 10	,, ,, ,,	244 feet.
From 3000 to 4000	,,	3°·7	,, 10	,, ,, ,,	271 feet.
From 4000 to 5000	,,	3°·1	,, 6	,, ,, ,,	323 feet.

These results do not differ very greatly from the law of decrement of temperature, as found from observations on mountain-sides, viz. 1° in 300 feet.

When the Sky was partially Clear,

Up to	1000 feet was	7°·2	from 5	experiments, or 1° in	139 feet.
From 1000 to 2000	,,	5°·3	,, 5	,, ,, ,,	189 feet.
From 2000 to 3000	,,	4°·6	,, 5	,, ,, ,,	254 feet.
From 3000 to 4000	,,	3°·4	,, 7	,, ,, ,,	295 feet.
From 4000 to 5000	,,	2°·9	,, 6	,, ,, ,,	345 feet.

These results differ considerably from those found in a cloudy sky, and doubtless the difference between experiments carried on under a cloudless sky at these elevations would differ still more. They do not at all confirm the law of gradation of temperature of 1° in 300 feet.

THE DECREASE OF THE TEMPERATURE OF THE AIR

At heights exceeding 5000 feet.

	feet.		feet.							
From	5,000	to	6,000	was 2°·8	from	10	experiments,	or 1° in	357	feet.
,,	6,000	,,	7,000	,, 2·8	,,	8	,,	,,	357	,,
,,	7,000	,,	8,000	,, 2·7	,,	8	,,	,,	370	,,
,,	8,000	,,	9,000	,, 2·6	,,	8	,,	,,	384	,,
,,	9,000	,,	10,000	,, 2·6	,,	8	,,	,,	384	,,
,,	10,000	,,	11,000	,, 2·6	,,	8	,,	,,	384	,,
,,	11,000	,,	12,000	,, 2·6	,,	6	,,	,,	384	,,
,,	12,000	,,	13,000	,, 2·5	,,	6	,,	,,	400	,,
,,	13,000	,,	14,000	,, 2·2	,,	6	,,	,,	455	,,
,,	14,000	,,	15,000	,, 2·1	,,	4	,,	,,	477	,,
,,	15,000	,,	16,000	,, 2·1	,,	4	,,	,,	477	,,
,,	16,000	,,	17,000	,, 1·9	,,	4	,,	,,	527	,,
,,	17,000	,,	18,000	,, 1·8	,,	4	,,	,,	556	,,
,,	18,000	,,	19,000	,, 1·8	,,	4	,,	,,	556	,,
,,	19,000	,,	20,000	,, 1·5	,,	4	,,	,,	667	,,
,,	20,000	,,	21,000	,, 1·3	,,	4	,,	,,	771	,,
,,	21,000	,,	22,000	,, 1·3	,,	4	,,	,,	771	,,
,,	22,000	,,	23,000	,, 1·0	,,	4	,,	,,	1000	,,
,,	23,000	,,	24,000	,, 1·3	,,	2	,,	,,	771	,,
,,	24,000	,,	25,000	,, 1·1	,,	2	,,	,,	909	,,
,,	25,000	,,	26,000	,, 1·0	,,	1	,,	,,	1000	,,
,,	26,000	,,	27,000	,, 1·0	,,	1	,,	,,	1000	,,
,,	27,000	,,	28,000	,, 0·9	,,	1	,,	,,	1111	,,
,,	28,000	,,	29,000	,, 0·8	,,	1	,,	,,	1250	,,

These results follow almost in sequence with those found with the partially clear sky, and together show that a change of temperature of 1° takes place in 139 feet near the earth, and that it requires fully 1000 feet, for a change of 1°, at the height of 30,000 feet; the intermediate heights require a gradually increasing space between these limits to its elevation, and plainly indicate that the theory of a decline of temperature of 1° for every 300 feet of ascent must be abandoned.

By adding successively together the decrease due to each 1000 feet, we have the whole decrease of temperature from the earth to the different elevations:—

	ft.		feet.				feet.
From	0	to	1,000	the decrease was	7°·2,	or 1° on the average of	139
,,			2,000	,,	12·5	,,	160
,,			3,000	,,	17·1	,,	176
,,			4,000	,,	20·5	,,	195
,,			5,000	,,	23·2	,,	211
,,			6,000	,,	26·0	,,	230
,,			7,000	,,	28·8	,,	243
,,			8,000	,,	31·5	,,	254
,,			9,000	,,	34·1	,,	263

	ft.		feet.				feet.
From	0	to	10,000	the decrease was	36°·7,	or 1° on the average of	272
,,			11,000	,,	39·3	,,	279
,,			12,000	,,	41·9	,,	286
,,			13,000	,,	44·4	,,	293
,,			14,000	,,	46·6	,,	300
,,			15,000	,,	48·7	,,	308
,,			16,000	,,	50·8	,,	314
,,			17,000	,,	52·7	,,	322
,,			18,000	,,	54·5	,,	330
,,			19,000	,,	56·3	,,	337
,,			20,000	,,	57·8	,,	346
,,			21,000	,,	59·1	,,	355
,,			22,000	,,	61·4	,,	358
,,			23,000	,,	62·4	,,	368
,,			24,000	,,	63·7	,,	377
,,			25,000	,,	64·8	,,	386
,,			26,000	,,	65·8	,,	396
,,			27,000	,,	66·8	,,	404
,,			28,000	,,	67·7	,,	413
,,			29,000	,,	68·5	,,	423
,,			30,000	,,	70·0	,,	428

These results, showing the whole decrease of temperature with different elevations, differ considerably from those which would be found on the supposition of a decline of 1° of temperature for every 300 feet. The observed decrease in the first 1000 feet, viz. 7°·2, is more than double of that given on this supposition, viz. 3°·3, and the observed values are all greater at the lower elevation; but the difference between the two becomes less and less, till at the height of 14,000 feet they agree. At greater elevations they again differ, but in the contrary way, the observed values being now the smaller,—the differences between the two increasing with increased elevation, till at 30,000 feet the difference amounts to no less than 30°—the observed values showing a decline of 70°, and theory a decline of 100°.

The numbers in the last column show the average increment of height for a decline of 1°, as found by using the temperatures of the extremities of the column alone; and they do not differ much from those found by Gay-Lussac, Rush and Green, and Welsh, at the same elevations.

At 14,000 feet the average is the same as that of theory, viz. 1° in 300 feet; and certain it is, in any balloon ascent exceeding 8000 feet, where the average decrement is 1° in 254 feet of ascent, and up to 20,000 feet, where the average is 355 feet, that such results would have been looked upon as generally confirming the above theory, and hence the necessity of including observations before leaving and near to the earth, and extending them to the highest point possible.

Respecting the rate of the decrease of temperature with height, it is abundantly evident that much uncertainty would always prevail, how great soever the accumulation of observations of mountain temperature might be, and the only means of determining this important element is by balloon ascents.

In the preceding Table it will be seen that the decrease of temperature in the first 5000 feet exceeds 23°, and that even in cloudy states of the sky it amounts to 20°. So large a decrease of temperature taking place, whether the sky be clear or cloudy, within the first 5000 feet of the earth, it became very desirable, and indeed necessary, to ascertain how this change of tempe-

rature is distributed: for this purpose all the observations of the temperature of the air taken within this distance of the earth were laid down upon large diagrams; a curved line was made to pass through or near them, and the reading at every 100 feet was taken from these curves, and those at every even hundred were inserted in the following Tables, as well as those from the projected curves as found by joining the observations themselves, and in this way the following Tables were formed:—

TABLE V.—Showing the Mean Temperature of the Air at every 200 feet up to 5000 feet.

Height, in feet, above the mean level of the sea.	Temperature of the Air.				
	Ascending.				
	Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
July 17.			°	°	°
5000	From 9h 43m a.m. to 9h 51m a.m.	In cloud.	39·3	39·3	0·0
4800			40·4	40·4	0·0
4600			41·4	41·4	0·0
4400			42·4	42·4	0·0
4200			43·4	43·4	0·0
4000			44·5	44·5	0·0
3800		Under cloud.	45·2	45·2	0·0
3600			46·0	46·0	0·0
3400			46·9	46·9	0·0
3200			47·8	47·8	0·0
3000			48·6	48·6	0·0
2800			49·4	49·4	0·0
2600			50·3	50·3	0·0
2400			51·0	51·0	0·0
2200			51·7	51·7	0·0
2000			52·5	52·5	0·0
1800			53·4	53·4	0·0
1600			54·3	54·3	0·0
1400			55·2	55·2	0·0
1200			56·0	56·0	0·0
1000			56·9	56·9	0·0
800			57·7	57·7	0·0
600			58·6	58·6	0·0
400			59·5	59·5	0·0
200			60·5	60·5	0·0
0			61·5	61·5	0·0

July 17.—The results are dependent upon the observations before leaving the earth, joined to those taken at and above 3800 feet; but they accord with others under the same state of the sky, indicating an almost uniformly decreasing temperature until the thick cloud was reached.

July 30.—The fluctuations on this day are better shown here than in the preceding section; there seem to have been no fewer than four or five different strata, on this day, within 7000 feet of the earth, experienced during the ascent and passage of the balloon till the time of descent, which was rapid, and during which the increase of temperature was gradual throughout.

TABLE V. (*continued.*)

Height, in feet, above the mean level of the sea.	Temperature of the Air.									
	Ascending.					Descending.				
	Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
July 30.			°	°	°			°	°	°
5000	From 4h 36m p.m. to 5h 11m p.m.	Misty	48·2	48·2	0·0	From 6h 21m p.m. to 6h 30m p.m.	..	47·3	47·3	0·0
4800		..	48·2	48·8	− 0·6		..	47·6	47·6	0·0
4600		..	49·7	49·3	+ 0·4		..	47·9	47·9	0·0
4400		..	50·9	49·8	1·1		..	48·2	48·2	0·0
4200		..	51·7	50·3	1·4		..	48·6	48·6	0·0
4000		..	52·0	50·8	+ 1·2		..	49·2	49·2	0·0
3800		..	50·6	51·2	− 0·6		..	49·9	49·9	0·0
3600		..	50·7	51·7	1·0		..	50·9	50·9	0·0
3400		..	51·5	52·2	0·7		..	52·0	52·0	0·0
3200		..	52·2	52·8	0·6		..	53·0	53·0	0·0
3000		..	52·7	53·2	0·5		..	54·1	54·1	0·0
2800		..	53·2	53·8	0·6		..	55·2	55·2	0·0
2600		..	53·7	54·6	− 0·9		..	56·3	56·3	0·0
2400		..	57·0	55·3	+ 1·7		..	57·3	57·3	0·0
2200		..	59·0	56·0	3·0		..	58·2	58·2	0·0
2000		..	59·5	57·0	1·5		..	59·2	59·2	0·0
1800		..	60·0	58·1	1·9		..	60·0	60·0	0·0
1600		..	60·9	59·2	1·7		..	60·9	60·9	0·0
1400		..	61·9	60·2	1·7		..	61·5	61·5	0·0
1200		..	62·0	61·6	+ 0·4		..	62·2	62·2	0·0
1000		..	62·9	62·9	0·0		..	63·2	63·2	0·0
800		..	64·0	64·0	0·0		..	64·2	64·2	0·0
600		..	65·2	65·2	0·0		..	65·1	65·1	0·0
400		..	66·8	66·8	0·0		..	66·0	66·0	0·0
200		..	68·6	68·6	0·0		..	67·0	67·0	0·0
0		..	70·7	70·7	0·0		..	68·0	68·0	0·0
August 18.										
5000	From 0h 53m p.m. to 1h 11m p.m.	Above cloud.	48·5	48·5	0·0	From 3h 50m p.m. to 4h 5m p.m.	In cloud.	49·5	49·5	0·0
4800			48·8	48·8	0·0			50·2	50·2	0·0
4600			49·0	49·0	0·0			51·0	51·0	0·0
4400			49·2	49·2	0·0			51·8	51·8	0·0
4200			49·5	49·5	0·0			52·5	52·5	0·0
4000			49·9	49·9	0·0		Below cloud.	53·2	53·2	0·0
3800		In a cumulus cloud.	50·4	50·4	0·0			54·0	54·0	0·0
3600			50·9	50·9	0·0			54·9	54·9	0·0
3400			51·5	51·5	0·0			55·7	55·7	0·0
3200			52·2	52·2	0·0			56·5	56·5	0·0
3000		Below cloud.	53·0	53·0	0·0			57·2	57·2	0·0
2800			53·7	53·7	0·0			57·9	57·9	0·0
2600			54·6	54·6	0·0			58·7	58·7	0·0
2400			55·6	55·6	0·0			59·4	59·4	0·0
2200			56·6	56·6	0·0			60·2	60·2	0·0
2000			57·5	57·5	0·0			61·0	61·0	0·0
1800			58·4	58·4	0·0			61·7	61·7	0·0
1600			59·5	59·5	0·0			62·4	62·4	0·0
1400			60·4	60·4	0·0			63·1	63·1	0·0
1200			61·7	61·7	0·0			64·0	64·0	0·0
1000			62·9	62·9	0·0			64·8	64·8	0·0
800			64·4	64·4	0·0			65·7	65·7	0·0
600			66·0	66·0	0·0			66·5	66·5	0·0
400			67·6	67·6	0·0			67·3	67·3	0·0
200			69·2	69·2	0·0			68·1	68·1	0·0
0			70·9	70·9	0·0			69·0	69·0	0·0

Table V. (*continued.*)

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
August 20.			°	°	°			°	°	°
4200	From $6^h 5^m$ p.m. to $6^h 47^m$ p.m.	Below cloud.	48·8	48·8	0·0	From $6^h 47^m$ p.m. to $7^h 20^m$ p.m.	Below cloud.	48·4	48·4	0·0
4000			49·8	49·8	0·0			48·8	48·8	0·0
3800			50·8	50·8	0·0			49·1	49·1	0·0
3600			51·6	51·6	0·0			49·6	49·6	0·0
3400			52·3	52·3	0·0			50·2	50·2	0·0
3200			53·0	53·0	0·0			50·9	50·9	0·0
3000			53·8	53·8	0·0			51·6	51·6	0·0
2800			54·7	54·7	0·0			52·2	52·2	0·0
2600			55·4	55·4	0·0			52·9	52·9	0·0
2400			56·1	56·1	0·0			53·3	53·3	0·0
2200			57·1	57·1	0·0			54·0	54·0	0·0
2000			58·0	58·0	0·0			54·6	54·6	0·0
1800			59·0	58·0	0·0			55·2	55·2	0·0
1600			59·9	59·9	0·0			55·8	55·8	0·0
1400			60·8	60·8	0·0			56·5	56·5	0·0
1200			61·7	61·7	0·0					
1000			62·5	62·5	0·0					
800			63·4	63·4	0·0					
600			64·3	64·3	0·0					
400			65·2	65·2	0·0					
200			66·3	66·3	0·0					
0			67·4	67·4	0·0					
5000	From $7^h 20^m$ p.m. to $7^h 47^m$ p.m.	In cloud.	45·6	45·6	0·0					
4800			46·2	46·2	0·0					
4600		Below cloud.	47·0	47·0	0·0					
4400			47·9	47·9	0·0					
4200			48·5	48·5	0·0					
4000			49·2	49·2	0·0					
3800			50·0	50·0	0·0					
3600			50·8	50·8	0·0					
3400			51·7	51·7	0·0					
3200			52·4	52·4	0·0					
3000			53·1	53·1	0·0					
2800			54·0	54·0	0·0					
2600			54·8	54·8	0·0					
2400			55·4	55·4	0·0					
2200			56·1	56·1	0·0					
2000			56·8	56·8	0·0					
1800			57·4	57·4	0·0					
1600			58·0	58·0	0·0					
1400			58·4	58·4	0·0					

Table V. (*continued.*)

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
August 21.			°	°	°			°	°	°
5000	From $4^h 30^m$ a.m. to $4^h 55^m$ a.m.	Below cloud.	43·5	43·5	0·0	From $6^h 36^m$ a.m. to $7^h 10^m$ a.m.	Below cloud.	43·5	43·5	0·0
4800			44·2	44·2	0·0			44·3	44·3	0·0
4600			45·0	45·0	0·0			45·0	45·0	0·0
4400			45·8	45·8	0·0			45·7	45·7	0·0
4200			46·5	46·5	0·0			46·4	46·4	0·0
4000			47·2	47·2	0·0			47·0	47·0	0·0
3800			47·9	47·9	0·0			47·7	47·7	0·0
3600			48·6	48·6	0·0			48·2	48·2	0·0
3400			49·4	49·4	0·0			48·8	48·8	0·0
3200			50·2	50·2	0·0			49·4	49·4	0·0
3000			51·0	51·0	0·0			50·1	50·1	0·0
2800			51·7	51·7	0·0			50·7	50·7	0·0
2600			52·4	52·4	0·0			51·4	51·4	0·0
2400			53·1	53·1	0·0			52·3	52·3	0·0
2200			53·8	53·8	0·0			53·2	53·2	0·0
2000			54·5	54·5	0·0			54·0	54·0	0·0
1800			55·2	55·2	0·0			54·9	54·9	0·0
1600			55·9	55·9	0·0			55·8	55·8	0·0
1400			56·6	56·6	0·0			56·7	56·7	0·0
1200			57·3	57·3	0·0			57·4	57·4	0·0
1000			58·0	58·0	0·0			58·0	58·0	0·0
800			58·7	58·7	0·0			58·7	58·7	0·0
600			59·4	59·4	0·0			59·4	59·4	0·0
400			60·2	60·2	0·0			60·2	60·2	0·0
200			61·1	61·1	0·0			61·0	61·0	0·0
0			61·8	61·8	0·0			62·0	62·0	0·0
September 1.										
4200	From $4^h 40^m$ p.m. to $5^h 32^m$ p.m.	..	46·9	46·9	0·0	From $5^h 32^m$ to $6^h 1^m$ p.m.	..	46·2	46·2	0·0
4000		..	47·5	47·5	0·0		..	46·5	46·5	0·0
3800		..	48·0	48·0	0·0		..	46·9	46·9	0·0
3600		..	48·6	48·6	0·0		..	47·4	47·4	0·0
3400		..	49·3	49·3	0·0		..	47·7	47·7	0·0
3200		..	49·9	49·9	0·0		..	48·1	48·1	0·0
3000		..	50·5	50·5	0·0		..	48·5	48·5	0·0
2800		..	51·2	51·2	0·0		..	49·1	49·1	0·0
2600		..	52·0	52·0	0·0		..	49·7	49·7	0·0
2400		..	52·9	52·9	0·0		..	50·2	50·2	0·0
2200		..	53·9	53·9	0·0		..	50·8	50·8	0·0
2000		..	54·7	54·7	0·0		..	51·5	51·5	0·0
1800		..	55·5	55·5	0·0		..	52·2	52·2	0·0
1600		..	56·4	56·4	0·0		..	53·0	53·0	0·0
1400		..	57·3	57·3	0·0		..	53·7	53·7	0·0
1200		..	58·3	58·3	0·0					
1000		..	59·2	59·2	0·0					
800		..	60·5	60·5	0·0					
600		..	61·7	61·7	0·0					
400		..	63·0	63·0	0·0					
200		..	64·2	64·2	0·0					
0		..	65·7	65·7	0·0					
3000	From $6^h 1^m$ p.m. to $6^h 6^m$ p.m.	Clouds above and below. Rain falling from the latter on the earth all day.	53·5	53·5	0·0	From $6^h 6^m$ p.m. to $6^h 15$ p.m.	Clouds above and below. Rain falling on the balloon.			
2800			53·6	53·6	0·0			53·5	53·5	0·0
2600			53·8	53·8	0·0			54·0	54·0	0·0
2400			53·9	53·9	0·0			54·5	54·5	0·0
2200			54·0	54·0	0·0			55·0	55·0	0·0
2000			54·0	54·0	0·0					
1800			54·0	54·0	0·0					
1600			54·2	54·2	0·0					
1400			55·0	55·0	0·0					

TABLE V. (*continued.*)

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
September 5.			°	°	°			°	°	°
5000	From 1^h 3^m p.m. to 1^h 12^m p.m.	Below cloud.	40·7	40·7	0·0	From 2^h 31^m p.m. to 3^h 6^m p.m.	..	47·2	47·2	0·0
4800			41·4	41·4	0·0		..	47·7	47·7	0·0
4600			42·2	42·2	0·0		..	48·1	48·1	0·0
4400			43·1	43·1	0·0		..	48·7	48·7	0·0
4200			44·0	44·0	0·0		..	49·3	49·3	0·0
4000			44·8	44·8	0·0		..	50·0	50·0	0·0
3800			45·6	45·6	0·0		..	50·6	50·6	0·0
3600			46·4	46·4	0·0		..	51·2	51·2	0·0
3400			47·2	47·2	0·0		..	51·8	51·8	0·0
3200			48·0	48·0	0·0		..	52·4	52·4	0·0
3000			48·8	48·8	0·0		..	53·0	53·0	0·0
2800			49·5	49·5	0·0		..	53·6	53·6	0·0
2600			50·2	50·2	0·0		..	54·2	54·2	0·0
2400			51·0	51·0	0·0		..	54·8	54·8	0·0
2200			51·9	51·9	0·0		..	55·4	55·4	0·0
2000			52·9	52·9	0·0		..	56·0	56·0	0·0
1800			53·8	53·8	0·0		..	56·6	56·6	0·0
1600			54·8	54·8	0·0		..	57·2	57·2	0·0
1400			55·8	55·8	0·0		..	57·8	57·8	0·0
1200			56·7	56·7	0·0		..	58·4	58·4	0·0
1000			57·5	57·5	0·0		..	59·2	59·2	0·0
800			58·4	58·4	0·0		..	59·7	59·7	0·0
600			59·3	59·3	0·0		..	60·2	60·2	0·0
400			60·2	60·2	0·0		..	61·2	61·2	0·0
200			61·1	61·1	0·0		..	62·0	62·0	0·0
0			62·0	62·0	0·0		..	62·8	62·8	0·0

On August 18, 20, 21, September 1, 5, and 8, there were no disturbing causes to any amount in operation within 5000 feet of the earth, and therefore the projected and adopted curves are identical.

TABLE V. (*continued.*)

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
September 8.			°	°	°				°	°
5000	From 4^h 47^m p.m. to 4^h 58^m p.m.	..	..	50·0	..	From 4^h 58^m p.m. to 5^h 6^m p.m.	..	..	51·1	
4800		..	..	50·4	..		..	..	50·3	
4600		..	..	50·9	..		..	..	49·9	
4400		..	..	51·3	..		..	..	49·8	
4200		..	..	51·9	..		..	..	50·0	
4000		..	..	52·7	..		..	..	50·3	
3800		..	..	53·6	..		..	..	51·0	
3600		..	..	54·4	..		..	..	51·8	
3400		..	..	55·0	..		..	..	52·3	
3200		..	..	55·7	..		..	..	53·1	
3000		..	..	56·4						
2800		..	..	57·4						
2600		..	..	58·7						
2400		..	..	59·7						
2200		..	..	60·4						
2000		..	..	61·0						
1800		..	..	61·8						
1600		..	..	62·5						
1400		..	..	63·6						
1200		..	..	64·4						
1000		..	..	65·1						
800		..	..	65·8						
600		..	..	66·5						
400		..	..	67·3						
200		..	..	68·2						
0		..	..	69·0						
5000	..	..	..	..	..	From 5^h 24^m p.m. to 6^h 10^m p.m.	..	..	51·4	
4800	..	..	..	..	..		..	..	51·2	
4600	..	..	..	..	..		..	..	51·2	
4400	..	..	..	..	..		..	..	51·2	
4200	..	..	..	..	..		..	..	51·2	
4000	..	..	..	..	..		..	..	51·2	
3800	..	..	..	..	..		..	..	51·3	
3600	..	..	..	..	..		..	..	51·4	
3400	..	..	..	..	..		..	..	51·7	
3200	..	..	..	..	..		..	..	52·3	
3000	..	..	..	..	..		..	..	53·9	
2800	..	..	..	..	..		..	..	54·4	
2600	..	..	..	..	..		..	..	55·0	
2400	..	..	..	..	..		..	..	55·7	
2200	..	..	..	..	..		..	..	56·2	
2000	..	..	..	..	..		..	..	56·5	
1800	..	..	..	..	..		..	..	57·0	
1600	..	..	..	..	..		..	..	57·5	
1400	..	..	..	..	..		..	..	58·2	
1200	..	..	..	..	..		..	..	59·0	
1000	..	..	..	..	..		..	..	60·2	
800	..	..	..	..	..		..	..	61·0	
600	..	..	..	..	..		..	..	61·6	
400	..	..	..	..	..		..	..	62·5	
200	..	..	..	..	..		..	..	63·2	
0	..	..	..	..	..		..	..	64·8	

The next Table has been formed by taking the difference between the temperatures at every consecutive 100 feet, in every ascent and descent, up to 5000 feet.

TABLE VI.—Showing the Decrease of Temperature with every Increase of Height of 100 feet up to 5000 feet.

Height above the level of the sea.		July 17.	July 30.		August 18.		August 20.			August 21.	
		State of the Sky.									
		Cloudy.	Clear.	Cloudy.	Clear.	Cloudy.	Cloudy.			Cloudy.	
From	To	Ascending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Ascending.	Descending.
feet.	feet.	°	°	°	°	°	°	°	°	°	°
4900	5000	0·6	0·3	0·1	0·2	0·3	..	..	0·3	0·3	0·4
4800	4900	0·5	0·3	0·2	0·1	0·4	..	..	0·4	0·4	0·3
4700	4800	0·5	0·2	0·1	0·1	0·4	..	..	0·3	0·4	0·4
4600	4700	0·5	0·3	0·2	0·1	0·4	..	..	0·4	0·4	0·3
4500	4600	0·5	0·2	0·1	0·1	0·4	..	..	0·3	0·4	0·4
4400	4500	0·5	0·3	0·2	0·1	0·4	..	..	0·4	0·4	0·3
4300	4400	0·5	0·2	0·2	0·1	0·3	..	..	0·3	0·4	0·4
4200	4300	0·5	0·3	0·2	0·1	0·4	0·3	0·2	0·4	0·3	0·3
4100	4200	0·5	0·3	0·3	0·2	0·3	0·4	0·2	0·3	0·4	0·3
4000	4100	0·5	0·2	0·3	0·2	0·4	0·3	0·2	0·4	0·3	0·3
3900	4000	0·4	0·2	0·3	0·2	0·4	0·4	0·2	0·4	0·4	0·3
3800	3900	0·3	0·2	0·4	0·2	0·4	0·3	0·2	0·4	0·3	0·3
3700	3800	0·4	0·2	0·5	0·3	0·4	0·4	0·3	0·4	0·4	0·2
3600	3700	0·4	0·3	0·5	0·2	0·5	0·3	0·3	0·4	0·3	0·3
3500	3600	0·5	0·2	0·5	0·3	0·4	0·4	0·3	0·4	0·4	0·3
3400	3500	0·4	0·3	0·6	0·3	0·4	0·3	0·3	0·3	0·4	0·3
3300	3400	0·5	0·3	0·5	0·3	0·4	0·4	0·3	0·4	0·4	0·3
3200	3300	0·4	0·3	0·5	0·3	0·4	0·4	0·4	0·3	0·4	0·4
3100	3200	0·4	0·2	0·5	0·4	0·4	0·4	0·3	0·4	0·4	0·3
3000	3100	0·4	0·2	0·6	0·4	0·3	0·4	0·4	0·3	0·4	0·3
2900	3000	0·4	0·3	0·6	0·4	0·4	0·4	0·3	0·4	0·4	0·3
2800	2900	0·4	0·3	0·5	0·4	0·3	0·4	0·4	0·5	0·3	0·3
2700	2800	0·5	0·4	0·6	0·4	0·4	0·4	0·3	0·4	0·4	0·3
2600	2700	0·4	0·4	0·5	0·4	0·4	0·4	0·4	0·3	0·3	0·4
2500	2600	0·3	0·4	0·5	0·5	0·4	0·4	0·3	0·4	0·4	0·4
2400	2500	0·4	0·3	0·5	0·5	0·3	0·5	0·4	0·3	0·3	0·5
2300	2400	0·4	0·3	0·4	0·5	0·4	0·4	0·3	0·4	0·4	0·4
2200	2300	0·4	0·4	0·5	0·5	0·4	0·5	0·4	0·3	0·3	0·5
2100	2200	0·4	0·5	0·5	0·5	0·4	0·4	0·3	0·4	0·4	0·4
2000	2100	0·4	0·5	0·5	0·4	0·4	0·5	0·4	0·3	0·3	0·4
1900	2000	0·4	0·5	0·4	0·5	0·3	0·4	0·3	0·3	0·4	0·5
1800	1900	0·5	0·6	0·4	0·4	0·4	0·5	0·4	0·3	0·3	0·4
1700	1800	0·4	0·6	0·5	0·5	0·3	0·4	0·3	0·2	0·3	0·5
1600	1700	0·5	0·5	0·4	0·5	0·4	0·5	0·4	0·2	0·4	0·4
1500	1600	0·4	0·5	0·3	0·4	0·3	0·4	0·3	0·2	0·3	0·5
1400	1500	0·5	0·5	0·3	0·5	0·4	0·5	0·4	0·2	0·4	0·4
1300	1400	0·4	0·7	0·3	0·6	0·5	0·4	..	..	0·3	0·4
1200	1300	0·5	0·7	0·4	0·6	0·4	0·5	..	..	0·4	0·3
1100	1200	0·4	0·7	0·5	0·6	0·5	0·4	..	..	0·3	0·3
1000	1100	0·4	0·6	0·5	0·7	0·4	0·5	..	..	0·4	0·3
900	1000	0·4	0·5	0·5	0·7	0·4	0·4	..	..	0·3	0·3
800	900	0·4	0·6	0·5	0·8	0·4	0·5	..	..	0·4	0·4
700	800	0·4	0·6	0·4	0·8	0·4	0·5	..	..	0·3	0·3
600	700	0·5	0·6	0·5	0·8	0·4	0·5	..	..	0·4	0·4
500	600	0·5	0·8	0·4	0·8	0·4	0·5	..	..	0·4	0·4
400	500	0·5	0·8	0·5	0·8	0·4	0·5	..	..	0·4	0·4
300	400	0·5	0·9	0·5	0·8	0·4	0·5	..	..	0·4	0·4
200	300	0·5	0·9	0·5	0·8	0·4	0·5	..	..	0·5	0·4
100	200	0·5	1·0	0·5	0·8	0·4	0·6	..	..	0·4	0·5
0	100	0·5	1·1	0·5	0·9	0·5	0·6	..	..	0·3	0·5

Height above the level of the sea.		September 1.			September 5.		September 8.			Mean.			
		State of the Sky.											
		Partially clear.			Partially clear.	Cloudy.	Cloudy.			Cloudy.	Number of observations.	Clear.	Number of observations.
From	To	Ascending.	Descending.	Ascending.	Ascending.	Descending.	Ascending.	Descending.	Descending.				
feet.	feet.	°	°	°	°	°	°	°	°	°		°	
4900	5000	..	..	..	0·3	0·1	0·2	0·4	0·1	0·3	10	0·3	3
4800	4900	..	..	..	0·3	0·1	0·2	0·4	0·1	0·3	10	0·3	3
4700	4800	..	..	..	0·4	0·2	0·2	0·2	..	0·3	9	0·3	3
4600	4700	..	..	..	0·4	0·2	0·3	0·2	..	0·3	9	0·3	3
4500	4600	..	..	..	0·5	0·3	0·2	0·1	0·1	0·3	10	0·3	3
4400	4500	..	..	..	0·4	0·3	0·2	0·1	0·1	0·3	10	0·3	3
4300	4400	..	..	..	0·5	0·3	0·3	0·1	0·0	0·3	10	0·3	3
4200	4300	..	..	..	0·4	0·4	0·3	0·1	0·0	0·3	12	0·3	3
4100	4200	0·3	0·2	..	0·4	0·3	0·4	0·3	0·0	0·3	12	0·3	5
4000	4100	0·3	0·2	..	0·4	0·3	0·4	0·4	0·0	0·3	12	0·3	5
3900	4000	0·3	0·2	..	0·4	0·3	0·5	0·4	0·1	0·3	12	0·3	5
3800	3900	0·3	0·2	..	0·4	0·3	0·4	0·4	0·1	0·3	12	0·3	5
3700	3800	0·3	0·3	..	0·4	0·3	0·4	0·4	0·1	0·3	12	0·3	5
3600	3700	0·3	0·2	..	0·4	0·3	0·4	0·4	0·1	0·3	12	0·3	5
3500	3600	0·3	0·2	..	0·4	0·3	0·3	0·4	0·1	0·3	12	0·3	5
3400	3500	0·3	0·2	..	0·4	0·3	0·3	0·4	0·2	0·3	12	0·3	5
3300	3400	0·3	0·2	..	0·4	0·3	0·3	0·4	0·3	0·4	12	0·3	5
3200	3300	0·3	0·2	..	0·4	0·3	0·4	0·4	0·3	0·4	12	0·3	5
3100	3200	0·3	0·2	..	0·4	0·3	0·3	..	0·3	0·4	11	0·3	5
3000	3100	0·3	0·2	..	0·4	0·3	0·4	..	0·3	0·4	11	0·3	5
2900	3000	0·4	0·3	..	0·3	0·3	0·5	..	0·1	0·4	11	0·3	5
2800	2900	0·4	0·3	..	0·4	0·3	0·5	..	0·2	0·4	11	0·4	5
2700	2800	0·4	0·3	..	0·3	0·3	0·5	..	0·4	0·4	11	0·4	5
2600	2700	0·4	0·3	..	0·4	0·3	0·5	..	0·4	0·4	11	0·4	5
2500	2600	0·4	0·3	..	0·4	0·3	0·5	..	0·4	0·4	11	0·4	5
2400	2500	0·4	0·3	..	0·4	0·3	0·5	..	0·3	0·4	11	0·4	5
2300	2400	0·4	0·3	..	0·4	0·3	0·4	..	0·3	0·4	11	0·4	5
2200	2300	0·4	0·3	..	0·5	0·3	0·3	..	0·2	0·4	11	0·4	5
2100	2200	0·4	0·3	..	0·5	0·3	0·3	..	0·2	0·4	11	0·4	5
2000	2100	0·4	0·4	..	0·5	0·3	0·3	..	0·1	0·4	11	0·4	5
1900	2000	0·4	0·4	..	0·4	0·3	0·4	..	0·2	0·4	11	0·4	5
1800	1900	0·4	0·4	..	0·5	0·3	0·4	..	0·3	0·4	11	0·4	5
1700	1800	0·4	0·4	..	0·5	0·3	0·3	..	0·2	0·3	11	0·5	5
1600	1700	0·4	0·4	..	0·5	0·3	0·4	..	0·3	0·4	11	0·5	5
1500	1600	0·4	0·4	0·4	0·5	0·3	0·5	..	0·3	0·4	11	0·5	6
1400	1500	0·5	0·3	0·4	0·5	0·3	0·5	..	0·4	0·4	11	0·5	6
1300	1400	0·5	..	..	0·4	0·3	0·4	..	0·4	0·4	9	0·5	4
1200	1300	0·5	..	..	0·5	0·3	0·4	..	0·4	0·4	9	0·5	4
1100	1200	0·4	..	..	0·4	0·3	0·3	..	0·6	0·4	9	0·5	4
1000	1100	0·5	..	..	0·4	0·3	0·4	..	0·6	0·4	9	0·5	4
900	1000	0·5	..	..	0·4	0·3	0·3	..	0·4	0·4	9	0·5	4
800	900	0·6	..	..	0·5	0·4	0·4	..	0·4	0·4	9	0·6	4
700	800	0·6	..	..	0·4	0·3	0·3	..	0·3	0·4	9	0·6	4
600	700	0·5	..	..	0·5	0·4	0·4	..	0·3	0·4	9	0·6	4
500	600	0·6	..	..	0·4	0·4	0·4	..	0·4	0·4	9	0·6	4
400	500	0·6	..	..	0·5	0·4	0·4	..	0·5	0·4	9	0·7	4
300	400	0·7	..	..	0·4	0·4	0·4	..	0·3	0·4	9	0·7	4
200	300	0·7	..	..	0·5	0·4	0·5	..	0·4	0·5	9	0·8	4
100	200	0·7	..	..	0·4	0·4	0·4	..	..	0·5	9	0·8	4
0	100	0·8	..	..	0·5	0·4	0·4	..	..	0·5	9	0·9	4

An inspection of this Table shows that the largest numbers are those situated at the bottom, and the smallest at the top of each column in all states of the sky, and therefore that the decline of temperature in equal spaces was largest in that space next the earth, and gradually less with increase of elevation.

The numbers in the last column of the Table show the average value at each 100 feet, the one in cloudy states of the sky, and the other in partially clear states, with the number of experiments upon which each result is based.

FROM THESE RESULTS THE DECLINE OF TEMPERATURE

When the Sky was Cloudy

For the first 300 feet was ......0°·5 for every 100 feet.
From 300 feet to 3400 feet was 0°·4 " "
" 3400 " 5000 " 0°·3 " "

Therefore in cloudy states of the sky the temperature of the air decreases nearly uniformly with the height above the surface of the earth nearly up to the cloud.

When the Sky was partially Cloudy.

In the first ......100 feet there was a decline of 0°·9
From 100 feet to 300 " " " 0°·8 for each 100 feet.
" 300 " 500 " " " 0°·7 " "
" 500 " 900 " " " 0°·6 " "
" 900 " 1800 " " " 0°·5 " "
" 1800 " 2900 " " " 0°·4 " "
" 2900 " 5000 " " " 0°·3 " "

The decline of temperature near the earth with a partially clear sky is nearly double of that with a cloudy sky; at elevations above 4000 feet, the changes for 100 feet seem to be the same in both states of the sky.

In some cases, as on July 30, the decline of temperature in the first 100 feet was as large as 1°·1.

From these results we may conclude that in a cloudy state of the sky the decline of temperature is nearly uniform up to the clouds; that with a clear sky the greatest change is near the earth, being a decline of 1° in less than 100 feet, gradually decreasing, as in the general law indicated in the preceding Section, till it requires a space of 300 feet at the height of 5000 feet for a change of 1° of temperature. These results lead to the same conclusion as before, viz. that the theory of gradation of 1° of temperature for every 300 feet of elevation must be abandoned. As regards the law indicated by all these experiments, it is far more natural and consistent, than that a uniform rate of decrease could be received as a physical law up even to moderate elevations.

§ 6. VARIATION OF THE HYGROMETRIC CONDITION OF THE AIR WITH ELEVATION.

All the adopted readings of the temperature of the dew-point in Section 4 were laid down on diagrams of a large scale, and their points were joined; and as it was evident that there were strata of moist air, and that the changes do not follow any regular decrease as in the case of the temperature of the air, it was therefore not considered prudent to adopt any curve with the view of obtaining normal results, but to use the projected curve as simply found by joining the points as stated above. From the readings at every 1000 feet of elevation the next Table was formed; other readings were taken at angular intermediate points, and these are included in the remarks following the Table. The numbers under the heading of "Tension of Vapour" are formed by using "Regnault's Tables," and the degree of humidity in the next column has been calculated by using the observed temperature of the air corresponding to the observed temperature of the dew-point.

TABLE VII.—Showing the Variation of the Hygrometric condition of the Air at every 1000 feet of Height.

Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
July 17.					
26000			Unknown, but certainly less than −20°.	Unknown, but certainly less than ·017.	Unknown, but certainly less than
25000					
24000					
23000					
22000					
21000				in.	
20000	From $9^h\ 43^m$ a.m. to $11^h\ 1^m$ a.m.	Above cloud.	16°·0	·089	48
19000			24·1	·130	54
18000			23·8	·128	62
17000			23·0	·123	66
16000			22·8	·122	68
15000			23·5	·126	72
14000			23·9	·128	78
13000			22·0	·118	82
12000			23·8	·128	92
11000			23·3	·125	89
10000			19·0	·103	73
9000			21·0	·113	70
8000		In cloud.	27·9	·152	84
7000			30·0	·167	78
6000			32·0	·181	90
5000			32·0	·181	76
4000			34·0	·196	65
3000		Below cloud.	39·6	·243	73
2000			44·7	·296	75
1000			49·7	·357	77
0			55·0	·433	79

July 17.—At the earth's surface the dew-point was 55°, which seemed to decrease gradually to the height of about 4000 feet, the relative humidity decreasing from 79 to 65 within the same space; on entering a cloud the rate of the decrease of the dew-point was checked, and for a space of 3000 feet was almost constant, differing but little from 32°, whilst the relative humidity increased to 91 at 5800 feet. On leaving the cloud at 8000 feet high, and between that and 9600 feet, both the dew-point and the relative humidity decreased quickly, the former to 17°·9 and the latter to 65. From 9600 feet to 11,500 feet, whilst the temperature of the air remained at 26°, the dew-point increased to 24°·8, and the relative humidity to 95, closely approaching to saturation. From the height of 12,000 feet to 19,000 feet, the amount of water in the air was almost constant, the dew-point undergoing scarcely any

variation, but during which time there was a great increase of temperature, and consequently the relative humidity decreased with rapidity from 95 to 39. The balloon then fell from 19,500 feet to 19,200 feet, the temperature of the air decreased to 38°, and the dew-point increased from 19½° to 21°, and the humidity increased to 49. After 19,200 feet the dew-point decreased with rapidity to 16° at 20,000 feet, with a humidity of 48; and afterwards with great rapidity to a dew-point of less than −12° at 21,000 feet; and at heights exceeding this the dew-point is unknown, but was certainly lower than −20°, and probably as low as −30° up to 24,000 feet; from the observations of the dry- and wet-bulb thermometers it seems to have been as low as −50° at 25,000 feet; therefore the tension of vapour above 20,000 feet must have varied from about 0·015 in. to less than 0·01 in., and the degree of humidity to have decreased to 2, or even less. In this series we can distinctly trace a stratum of moist air in the cloud above 4000 feet, and again between the heights of 9500 feet and 11,500 feet. From 11,500 feet to 19,000 feet the tension of vapour differed but very little from 0·13 inch; then the amount of water present in the same mass of air was nearly constant for 8000 feet in vertical height; immediately after this there were some irregularities, and above 20,000 feet the air was dry, being almost free from vapour.

Table VII. (*continued.*)

Height, in feet, above the mean level of the sea.	Humidity of the Air.									
	Ascending.					Descending.				
	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
July 30.			°	in.				°	in.	
6000	From 4^h 36^m p.m. to 5^h 43^m p.m.	Misty.	33·8	·194	68	From 5^h 44^m p.m. to 6^h 30^m p.m.	...	33·0	·188	61
5000			37·2	·222	66		...	36·7	·218	67
4000			39·5	·242	63		...	38·5	·233	66
3000			41·4	·261	65		...	42·3	·270	65
2000			43·2	·279	54		...	41·8	·265	53
1000			44·2	·290	51		...	45·8	·308	52
0			53·0	·403	54		...	47·4	·328	48

July 30.—The temperature of the dew-point in this ascent was constantly varying: on the ground it was 53°, at 1000 feet it was 44¼°, but at intermediate points it was sometimes on one side and sometimes on the other, to the amount of 1° or 2° from the curve-line joining these points; then up to 2400 feet there was a stratum of moist air, and above 3600 feet there were strata of moist and dry air alternately for 2000 feet; higher than this there was a stratum of dry air from 5600 to 6400 feet, and higher still one of moist from 6500 feet to the highest point reached: these terms, moist and dry, have reference to a curve-line, which was made to pass near every point as laid down from observation; and the same phenomena generally prevailed during the descent. The relative humidity generally increased to the highest point reached.

Table VII. (*continued.*)

Height, in feet, above the mean level of the sea.	Hygrometrical results.									
	Ascending.					Descending.				
	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
August 18.			°	in.				°	in.	
11000	From 1^h 2^m p.m. to 1^h 21^m p.m.	...	26·0	·141	59	From 1^h 22^m p.m. to 1^h 48^m p.m.	...	24·5	·132	51
10000		...	28·0	·153	58		...	27·0	·147	51
9000		...	31·8	·179	63		...	28·8	·158	49
8000		...	33·9	·195	65		...	37·0	·220	61
7000		...	35·9	·211	68		...	37·0	·220	53
6000		...	38·0	·229	71		...	37·5	·225	54
5000		...	41·0	·257	75		...	41·5	·265	66
4000		In a cumulus cloud.	47·6	·329	91		...	46·6	·318	76
3000			50·0	·361	90					
2000		...	51·0	·374	79					
1000		...	52·5	·396	72					
0		...	57·0	·465	62					
23000	From 1^h 49^m p.m. to 2^h 59^m p.m.	...	− 8·0	·029						
22000		...	−10·0	·026						
21000		...	−11·0	·025						
20000		...	− 8·0	·029	22					
19000		...	− 2·0	·040	22					
18000		...	1·8	·047	30	... From 3^h 0^m p.m. to 4^h 6^m p.m.	...	1·0	·046	31
17000		...	8·0	·062	27		Above cloud.	3·0	·050	32
16000		...	14·0	·082	42			5·0	·054	33
15000		...	19·2	·104	52			7·0	·060	34
14000		...	23·8	·128	61			9·2	·065	36
13000		...	24·7	·133	67			11·5	·072	36
12000		...	24·0	·129	59			14·0	·082	36
11000		...	28·0	·153	52			14·0	·082	34
10000		...	33·0	·188	52		...	15·2	·086	28
9000		...	36·1	·213	53		...	22·0	·118	35
8000		...	39·0	·238	57		...	34·5	·199	55
7000		...	39·2	·239	64		...	37·2	·222	61
6000		...	40·8	·255	59		In cloud.	40·0	·247	61
5000		...	42·2	·269	59			43·2	·279	62
4000		...	45·8	·308	70		... Below cloud.	46·2	·313	77
3000		...	...	...	...	...		49·0	·348	74
2000		...	...	...	...	...		51·5	·385	71
1000		...	...	...	...	...		54·0	·418	69
0		...	...	...	...	...		57·0	·465	66

August 18.—The temperature of the dew-point decreased from 57° on the ground to 52½° at 1000 feet, increased from 52½° at 1000 feet to 53¼° at 1700 feet whilst passing through mist, decreased to 50° at 2000 feet, and varied but little till 3800 feet was passed; the degree of humidity varying from 62 on the ground to 96 at 3800 feet when in a cumulus cloud. The dew-point decreased rather quickly to 41° at 5000 feet, and with less rapidity to 26° at 11,000 feet, the humidity varying from 96 at 3800 feet to 59 at 11,000 feet. Whilst almost stationary in elevation for some time, at the highest point the temperature of the air increased, whilst that of the dew-point decreased, so that the degree of humidity changed from 59 to 51. The balloon then descended: the temperature of the dew-point increased gradually to 31° at 8200 feet, and to 38° at 7800 feet: the humidity was 61 at the lower elevation: the dew-point remained nearly at the temperature of 37° from 7800 feet to 6000 feet, and rose to 48° at 3500 feet—its lowest

TABLE VII. (*continued.*)

Height, in feet, above the mean level of the sea.	Hygrometrical results. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
August 20.										
5000	From 6h 22m p.m. to 6h 47m p.m.		°	in.		From 6h 49m p.m. to 7h 20m p.m.		°	in.	
4000		...	46·2	·313	88		...	44·2	·290	84
3000		...	48·9	·346	84		...	46·6	·318	83
2000		...	50·0	·361	75		...	49·0	·349	82
1000		...	52·3	·393	69		...	51·7	·384	81
0		...	62·0	·556	83					
5000	From 7h 1m p.m. to 8h 5m p.m.	In cloud.	42·3	·270	88					
4000		...	44·2	·290	83					
3000		...	46·0	·311	77					
2000		...	50·5	·367	80					
1000		...	51·7	·384	81					
0										

point: the humidity increased from 53 at 7000 feet to 77 at 3500 feet. The balloon then ascended, and the dew-point fell to 37° at 8000 feet, and the humidity from 76 to 61.

The dew-point then increased somewhat to 39½° at 8500 feet, with a humidity of 65: from this elevation the dew-point decreased to 21° at 11,600 feet, with a degree of humidity of 51. The dew-point then turned to increase, and was 25½° at 12,400 feet, giving a humidity of 57 at this elevation; it then decreased gradually to 23° at 14,500 feet, and then rapidly to −8½° at 20,100 feet: the relative humidity was 59 at 12,400 feet, and 22 at 20,100 feet. Above 20,000 feet a dry stratum of air was entered and no dew was deposited on either of the hygrometers, their bulbs being reduced to a temperature of −10°.

In descending, the dew-point increased steadily to 14° at 12,000 feet, remained at this reading till nearly 10,000 feet, then increased rapidly to 34½° at 8000 feet, and then gradually and almost uniformly to 57° on the ground; the degree of humidity increased from 31 at 18,000 feet to 36 at 14,000 feet, remained at this value to 12,000 feet, decreased to 28 at 10,000 feet and then increased to 77 at 4000 feet, and was 66 on reaching the ground. In this series a narrow stratum of moist air was passed through between 1000 and 2000 feet from the earth, and then another on passing through a cumulus cloud at the height of 3800 feet; above this to 11,000 feet there was a constant decrease in the amount of water; the balloon then descended and the vapour increased steadily to 8000 feet, then a stratum of moist air was met with from 1000 to 2000 feet in thickness; from 6000 feet to 3500 feet on descending, and again from 3500 to 7000 feet on ascending, there was an increase and decrease respectively; between 8000 and 9000 feet and between 11,000 and 12,000 feet dry strata were passed; then for 2000 feet there was but little variation in the humidity of the air, above 15,000 feet there was a rapid decrease in the amount of vapour, till the air became very dry above 20,000 feet. In the descent one stratum only of moist air was passed through, viz. between 13,000 feet and 9000 feet from the earth.

August 20.—Between 400 and 600 feet a dry stratum of air was passed, then there was but little variation in the temperature of the dew-point, and the air was for the most part humid during the ascent.

TABLE VII. (*continued.*)

Height, in feet, above the mean level of the sea.	Hygrometrical results. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
August 21.			°	in.				°	in.	
14000	From 4h 30m a.m. to 5h 51m a.m.	...	−14·0	·022	18	From 5h 52m a.m. to 7h 10m a.m.	Above cloud.	−22·0	·015	12
13000		Above cloud.	− 3·7	·036	28			−13·0	·023	17
12000			+ 3·0	·050	36			0·0	·044	28
11000			10·0	·068	43			+13·1	·078	43
10000			14·1	·082	46			19·0	·103	51
9000			20·8	·112	56			18·0	·098	42
8000			25·2	·136	61			19·0	·103	38
7000			32·0	·181	71		In cloud.	32·0	·181	58
6000		In cloud.	39·0	·238	97			37·5	·225	89
5000			41·6	·263	93		Below cloud.	38·0	·229	81
4000		Below cloud.	40·8	·255	78			40·5	·252	78
3000			46·8	·321	86			45·7	·307	85
2000			50·9	·373	88			47·0	·323	77
1000			56·8	·462	96			49·7	·357	74
0			60·0	·518	94	...	...	56·0	·449	81

August 21.—The temperature of the dew-point decreased from 60° on the ground to 57° at 400 feet, then increased to 59° from 500 to 700 feet whilst passing through a thick mist, and to 60° at 1000 feet; a decline then took place to 50°·8 at 1300 feet, and 50°·9 at 2000 feet; from 2000 feet to 3200 feet there was at first a gradual, then more rapid decline to 40°·8 at 4000 feet; on entering cloud the dew-point increased to 41°·6, and on leaving it at about 6000 feet there was a sudden fall of 2°. The relative humidity was 94 on the ground: the air was saturated for 200 feet from 500 to 700 feet; the humidity was 74 at 1000 feet, 79 at 1300 feet, and 97 in the cloud. Above the cloud the dew-point decreased quickly and with but slight irregularities till the height of 10,400 feet, where it was 14½°, with a humidity of 48; at 14,000 feet the dew-point was −14°, and the air was dry, the relative humidity being 18. Above 14,000 feet the temperature of the dew-point declined to −20°, with a humidity of 12 only. During the half-hour this height was maintained the temperature of the air increased, whilst that of the dew-point diminished, so that the air became drier. On descending the air continued dry, the dew-point increased from −22° at 14,000 feet to +19° at 10,000 feet, the humidity increasing to 51; there was but little variation in the dew-point in the next 2000 feet, but during this space the temperature of the air increased 7°, so that the relative humidity was irregular. At 7500 feet the dew-point was 20°, at 6900 feet it was 42°; on approaching the clouds at the former height the relative humidity was 38, and at the latter it was 88. Whilst passing through the cloud both the temperatures of the air and dew-point declined, the latter to 38½°, and the humidity was 89. On descending below the cloud the dew-point increased gradually from 38½° at 4000 feet high, then quickly to 45°·7 at 3000 feet, then fell to 44°·7 at 2500 feet, then increased to 56° on reaching the ground. At 5800 feet the relative humidity was 83, between 2500 feet and 1500 feet it was 76 or 77, and it was 71 on the earth.

In this series, till the clouds were passed, there were two or three layers of moist air; but from the time of passing above the clouds, the air was constantly increasing in dryness till the greatest height was attained, and

TABLE VII. (*continued.*)

Height, in feet, above the mean level of the sea.	Hygrometrical results. Ascending. Between what times.	Ascending. Circumstances.	Ascending. Temperature of the dew-point.	Ascending. Elastic force of vapour.	Ascending. Degree of humidity.	Descending. Between what times.	Descending. Circumstances.	Descending. Temperature of the dew-point.	Descending. Elastic force of vapour.	Descending. Degree of humidity.
September 1.			°	in.				°	in.	
4000	From $4^h\ 52^m$ p.m. to $5^h\ 35^m$ p.m.	...	37·6	·225	69	From $5^h\ 36^m$ p.m. to $6^h\ 2^m$ p.m.	...	37·0	·220	70
3000		...	43·2	·279	76		...	38·7	·235	69
2000		...	47·9	·334	78		...	47·3	·327	86
1000		...	50·3	·365	72					
0										
4000	From $6^h\ 3^m$ p.m. to $6^h\ 6^m$ p.m.	Clouds above and below; rain falling on the earth.								
3000			45·8	·308	75					
2000			46·0	·311	74					
1000										
0										
September 5.										
24000	From $1^h\ 3^m$ to $1^h\ 53^m$ p.m.	Above cloud.	−36·0	...	16					
23000			−28·0	...	21					
22000			−20·5	...	32					
21000			−15·0	...	33					
20000			− 5·2	...	50	...	...	−37·0	...	8
19000			−20·0	...	20	...	...	−35·0	...	8
18000			− 4·0	...	41	...	...	−33·2	...	9
17000			+ 8·0	·062	76	...	...	−31·7	...	9
16000			13·2	·078	84	...	...	−30·0	...	9
15000			16·7	·093	89	...	From $2^h\ 7^m$ to $3^h\ 6^m$ p.m.	−28·5	...	10
14000			19·2	·104	88	...		−26·5	...	10
13000			22·5	·120	91	...		−24·5	...	10
12000			22·0	·118	81	...		−21·0	...	11
11000			26·0	·141	85	...		− 8·0	...	17
10000			26·5	·144	81	...		+ 3·0	·050	27
9000			27·5	·152	75	...		7·5	·061	29
8000			29·5	·163	71	...		12·7	·077	33
7000			35·0	·204	77	...		20·5	·110	43
6000		Below cloud.	36·2	·214	98	...		21·0	·113	39
5000			38·5	·233	91	...		21·5	·115	36
4000			40·8	·255	86	...	...	22·5	·120	33
3000			43·2	·279	81	...	...	38·7	·235	58
2000			45·5	·305	76	...	...	42·8	·275	62
1000			49·9	·360	76	...	...	46·2	·313	63
0			...	...	...	...	...	50·0	·361	64

increasing in dampness in the descent to 10,000 feet; then a dry stratum of air was met with, till on approaching the clouds and passing through them a moist stratum was passed; below the clouds there were but slight variations till the descent was completed.

September 1.—The changes of the dew-point in this ascent were more frequent and more abrupt than on August 20; there seemed to be different layers of moist air, varying in thickness from 200 to 300 and 400 feet up to 3000 feet, and above this the variations were smaller in amount and less in number. In the descent a moist stratum of air was met with between the heights of 2000 and 1300 feet.

September 5.—The temperature of the dew-point increased from 48½° on leaving the earth to 50½° at 700 feet; it then began to decrease, and was

TABLE VII. (*continued.*)

Height, in feet, above the mean level of the sea.	Hygrometrical results. Ascending. Between what times.	Ascending. Circumstances.	Ascending. Temperature of the dew-point.	Ascending. Elastic force of vapour.	Ascending. Degree of humidity.	Descending. Between what times.	Descending. Circumstances.	Descending. Temperature of the dew-point.	Descending. Elastic force of vapour.	Descending. Degree of humidity.
September 8.			°	in.				°	in.	
4000	From $4^h\ 47^m$ p.m. to $4^h\ 58^m$ p.m.	In cloud.	48·6	·343	86	From $5^h\ 0^m$ p.m. to $5^h\ 9^m$ p.m.	In cloud.	49·1	·349	96
3000		Below cloud.	51·8	·385	85					
2000			55·9	·447	83					
1000			59·5	·509	82					
0			61·5	·546	77					
5000	From $5^h\ 10^m$ p.m. to $5^h\ 18^m$ p.m.	...	33·5	·192	44	From $5^h\ 19^m$ p.m. to $6^h\ 10^m$ p.m.	...	45·0	·299	53
4000		...	50·8	·371	94		...	48·2	·338	89
3000		...	...	...	...		...	46·0	·311	75
2000		...	...	...	...		...	54·0	·418	
1000		...	...	...	...		...	58·0	·482	
0										

38°·9 between 4300 and 4700 feet, and declined to 36¼° from 5600 feet to 6800 feet. The relative humidity increased with slight variations from 67 on leaving the earth to 100 at 6800 feet in a cumulus cloud; on passing out of the cloud, the dew-point declined quickly to 30¼° at 7600 feet, then uniformly to 26½° at 9800 feet: the relative humidity decreased to 69 at 7600 feet, and increased to 81 at 10,000 feet; in the dew-point a slight increase then took place to 27° at 10,800 feet, and then a decrease to 19½° at 12,600 feet. The dew-point increased to 22½° at 13,000 feet, and the humidity to 91 at this elevation. The dew-point was 10½° at 16,800 feet, and the humidity was 77. A rapid decrease of the dew-point then took place to −21° at 19,200 feet, and then as rapid an increase to −7° at 19,500 feet and to −3° at 20,100 feet: the humidity declined to 18 at 19,200 feet, and increased to 36 at 19,500 feet, and to 50 at 20,100 feet.

Above this point the temperature of the dew-point rapidly declined: at 24,000 feet no dew was deposited on Regnault's Hygrometer, and at higher points still it must have been less than −50°.

In the descent there were no marked irregularities till the balloon was within 8000 feet of the earth, when the dew-point increased and decreased two or three times in the next 4000 feet, after which it declined gradually to the earth.

The variations in the amount of moisture in the air on this occasion were few and to small amounts after passing out of the cloud in which the air was saturated. About 1800 feet a dry stratum of air was passed, and after 2000 feet the amount of vapour became smaller, and was exceedingly small in amount at the higher elevations.

September 8.—The humidity in this ascent increased from the earth to the clouds with very little variation, but on passing above them the decrease was very great; the two latter results are not used in the formation of the next Table.

Table VIII.—Showing the Degree of Humidity at every 1000 feet up to 29,000 feet.

Height above the level of the sea.	July 17.		July 30.		August 18.				August 20.			August 21.		September 1.			September 5.		September 8.				Mean.				Height above the level of sea.
	State of the sky.																										
	Cloudy.		Partially clear.	Cloudy.	Clear.		Clear.		Cloudy.		Cloudy.	Cloudy.		Partially clear.	Cloudy.	Cloudy.	Partially clear.	Cloudy.	Cloudy.		Cloudy.						
	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Cloudy.	No. of observations.	Clear.	No. of observations.	
feet.																											feet.
29000																											29000
28000																											28000
27000																											27000
26000	Unknown.																								Unknown.		26000
25000																											25000
24000		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16	..	..	..	..	..	..	..	16	1	24000
23000	...	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	21	..	..	..	..	..	..	..	21	1	23000
22000	...	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	32	..	..	..	..	..	..	..	32	1	22000
21000	...	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	33	..	..	..	..	..	..	..	33	1	21000
20000	48	..	..	..	..	..	22	..	..	..	..	..	..	..	..	..	50	..	..	..	..	..	..	..	36	2	20000
19000	54	..	..	..	..	..	22	..	..	..	..	..	..	..	..	..	20	..	..	..	..	..	..	..	21	2	19000
18000	62	..	..	..	..	..	30	31	..	..	..	..	..	..	..	..	41	..	..	..	..	..	..	..	33	3	18000
17000	66	..	..	..	..	..	27	32	..	..	..	..	..	..	..	..	76	..	..	..	..	..	..	..	45	3	17000
16000	68	..	..	..	..	..	42	33	..	..	..	..	..	..	..	..	84	..	..	..	..	..	..	..	53	3	16000
15000	72	..	..	..	..	..	52	34	..	..	..	..	..	..	..	..	89	..	..	..	..	..	..	..	58	3	15000
14000	78	..	..	..	..	..	61	36	..	..	..	18	12	..	..	..	88	..	..	..	..	..	15	2	43	3	14000
13000	82	..	..	..	..	..	67	36	..	..	..	28	17	..	..	..	91	..	..	..	..	..	23	2	48	3	13000
12000	92	..	..	..	..	..	59	36	..	..	..	36	28	..	..	..	81	..	..	..	..	..	32	2	48	3	12000
11000	89	..	..	..	59	51	52	34	..	..	..	43	43	..	..	..	85	..	..	..	..	..	43	2	52	5	11000
10000	73	..	..	..	58	51	52	28	..	..	..	46	51	..	..	..	81	..	..	..	..	..	48	2	52	5	10000
9000	70	..	..	..	63	49	53	35	..	..	..	56	42	..	..	..	75	..	..	..	..	..	49	2	54	5	9000
8000	84	..	..	..	65	61	57	55	..	..	..	61	38	..	..	..	71	..	..	..	..	..	49	2	58	7	8000
7000	78	..	..	..	68	53	64	61	..	..	..	71	58	..	..	..	77	..	..	..	..	..	63	2	64	7	7000
6000	90	..	68	61	71	54	59	61	..	..	..	97	89	..	..	..	98	..	..	..	..	..	82	3	68	6	6000
5000	76	..	66	67	75	66	59	62	..	..	88	93	81	..	..	..	91	..	..	..	..	..	83	5	69	6	5000
4000	65	..	63	66	91	76	70	77	88	84	83	78	78	69	70	..	86	..	86	96	94	89	80	10	76	7	4000
3000	73	..	65	65	90	..	..	74	84	83	77	86	85	76	69	75	81	..	85	..	..	75	80	12	76	5	3000
2000	75	..	54	53	79	..	..	71	75	82	80	88	77	78	86	74	76	..	83	..	..	..	77	11	71	5	2000
1000	77	..	51	52	72	..	..	69	69	81	81	96	74	72	..	..	76	..	82	..	..	..	77	8	68	5	1000
0	79	..	54	48	62	..	..	66	83	..	..	94	81	..	..	..	76	..	77	..	..	..	77	6	63	4	0

On August 21 the observations were taken very early in the morning, in fact directly after sunrise, and it will be seen that the degree of humidity at the elevations exceeding 10,000 feet are very much smaller than in any other ascent at the same elevations; from this it would seem that a diurnal range takes place in this element at this elevation, as in the temperature of the air; so that in comparing the laws of moisture indicated by one ascent with those of another, the times of the day at which the experiment was made must be taken into account. It is possible, indeed almost certain, that at the height of 14,000 feet and above, the air would become more humid as the day advanced, the vapour rising from the upper surface of the clouds and ascending into the higher regions by the action of the sun.

An inspection of the numbers in this Table shows that the moisture in the air is very different at different times, both in its amount and distribution.

The degree of humidity in cloudy states of the sky in the lower strata of the air, as might be expected, is very much greater than in clear states; and above the clouds, at the same height, there are very different degrees in the different experiments.

The laws of moisture are indicated by these experiments, as found by taking the means of the numbers under the same state of the sky, and are as follows:—

With an overcast sky, the degree of humidity on the earth was	77	from	6	experiments.
At 1000 feet	77	,,	8	,,
2000 ,, ...	77	,,	11	,,
3000 ,, ...	80	,,	12	,,
4000 ,, ...	80	,,	10	,,
5000 ,, ...	83	,,	5	,,
6000 ,, ...	82	,,	3	,,

The laws of moisture here indicated are—an almost uniform state of humidity of the air to the height of 3000 feet, viz. 77; then a sudden increase to 80 in the next 1000 feet, and to 83 by 5000 feet, which slightly decreased to 82 by 6000 feet.

When the sky was partially clear, the degree of humidity

On the ground was	63	from 4	experiments.
At 1000 feet	68	„ 5	„
2000 „	77	„ 5	„
3000 „	76	„ 5	„
4000 „	76	„ 7	„
5000 „	69	„ 6	„
6000 „	68	„ 6	„

Above the clouds the degree of humidity

At 7000 feet was..........	64	from 7	experiments.
8000 „	58	„ 7	„
9000 „	52	„ 7	„
10,000 „	52	„ 7	„
11,000 „	48	„ 5	„
12,000 „	48	„ 5	„
13,000 „	43	„ 5	„
14,000 „	58	„ 2	„
15,000 „	53	„ 3	„
16,000 „	45	„ 3	„
17,000 „	33	„ 3	„
18,000 „	21	„ 2	„
19,000 „	36	„ 2	„
20,000 „	33	„ 1	„
21,000 „	32	„ 1	„
22,000 „	21	„ 1	„
23,000 „	16	„ 1	„
24,000, 25,000, 26,000, 27,000, 28,000, 29,000 }	unknown.		

The laws of moisture here indicate a humidity on the ground, with a partially clear sky, less by 15 than in cloudy skies, increasing to 77 by 3000 feet, then nearly constant to 5000 feet, when the humidity abruptly decreased to 69, and then nearly evenly at the rate of 5 in 1000 feet, till at 9000 and 10,000 feet it is 52; the degree then constantly decreases, till at heights exceeding 25,000 feet the degree of humidity is reduced to less than 10; and it would seem that at the higher elevations there is an almost entire absence of water.

These seem to be the general laws; but this regular diminution is evidently often interrupted, and strata of moist air exist at different elevations even up to 20,000 feet, and these may be of considerable thickness.

§ 7. Comparison of the Temperature of the Dew-point, as determined by different instruments.

Every simultaneous or nearly simultaneous determination of the dew-point by the different instruments or methods was copied out, and then all those determinations between every 1000 feet of elevation were collected together, and in this way the first five columns of the following Table were formed. The numbers in the last six columns were formed by taking the differences between the temperatures of the respective dew-points in the same horizontal line, or those taken at about the same height and elevation.

Table IX.—Showing the Temperature of the Dew-point, as determined at about the same height by different instruments and methods, and comparison of the results together.

Under 1000 feet.

Date.	Height.	Dew-point Temperatures: Calculated from: Dry and Wet (free).	Calculated from: Dry and Wet (aspirated).	Observed by: Daniell's Hygrometer.	Observed by: Regnault's Hygrometer.	Temperature of the Dew-point as determined by Dry and Wet (free) above that by: Dry and Wet (aspirated).	Dry and Wet (free) above that by: Daniell's Hygrometer.	Dry and Wet (free) above that by: Regnault's Hygrometer.	Dry and Wet (aspirated) above that by: Daniell's Hygrometer.	Dry and Wet (aspirated) above that by: Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
d h m	feet.	°	°	°	°	°	°	°	°	°	°
July 30 4 36	250	50·0		50·0			0·0				
4 42½	890	44·9		44·0			+0·9				
Aug. 18 0 56	490	55·0	54·6	55·0	53·9	+0·4	0·0	+1·1	−0·4	+0·7	+1·1
20 6 5	250	56·7		55·5		..	+1·2				
Sept. 1 4 40	250	56·5		52·0		..	+4·5				
4 53	320	51·9		52·0		..	−0·1				
5 0 0	490	49·5	49·9	49·0	45·5	−0·4	+0·5	+4·0	+0·9	+4·4	+3·5
8 5 43	887	59·9		58·5		..	+1·4				

Between 1000 and 2000 feet.

Aug. 20 6 33	1497	51·3	..	52·1	..	..	−0·8				
7 16½	1871	49·3	..	49·0	..	..	+0·3				
7 19⅛	1367	50·3	..	50·5	..	..	−0·2				
7 24	1907	50·5	..	49·0	..	..	+1·5				
Sept. 1 5 59	1620	47·8	..	50·0	..	..	−2·2				
7 2	1567	49·0	..	47·5	..	..	+1·5				
8 5 35½	1420	56·6	..	55·0	..	..	+1·6				

TABLE IX. (*continued.*)

Between 2000 and 3000 feet.

Date.		Height.	Dew-point Temperatures: Calculated from: Dry and Wet (free).	Calculated from: Dry and Wet (aspirated).	Observed by: Daniell's Hygrometer.	Observed by: Regnault's Hygrometer.	Temperature of the Dew-point as determined by Dry and Wet (free) above that by: Dry and Wet (aspirated).	Dry and Wet (free) above that by: Daniell's Hygrometer.	Dry and Wet (free) above that by: Regnault's Hygrometer.	Dry and Wet (aspirated) above that by: Daniell's Hygrometer.	Dry and Wet (aspirated) above that by: Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
d	h m	feet.	°	°	°	°	°	°	°	°	°	°
July 30	4 45½	2379	42·6	..	38·5	..	..	+4·1				
	6 25	2700	42·2	..	42·5	..	..	−0·3				
Aug. 18	1 7	2042	52·5	50·6	..	48·5	+1·9	..	+4·0	..	+2·1	
20	6 35½	2257	50·0	..	51·5	..	..	−1·5				
	6 37½	2959	48·8	..	48·5	..	..	+0·3				
Sept. 1	4 55	2214	48·1	..	45·1	..	..	+3·0				
	4 58½	2940	44·0	..	47·8	..	..	−3·8				
	5 44	2910	42·2	..	41·5	..	..	+0·7				
	5 53	2446	43·7	..	43·5	..	..	+0·2				
	5 57	2190	47·1	..	46·0	..	..	+1·1				
	6 4	2057	48·9	..	48·0	..	..	+0·9				
8	6 0⅛	2034	57·1	..	56·5	..	..	+0·6				

Between 3000 and 4000 feet.

Date.		Height.	Calc. Dry and Wet (free).	Calc. Dry and Wet (aspirated).	Obs. Daniell's Hygrometer.	Obs. Regnault's Hygrometer.	Free above: Dry and Wet (aspirated).	Free above: Daniell's Hygrometer.	Free above: Regnault's Hygrometer.	Aspirated above: Daniell's Hygrometer.	Aspirated above: Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
July 30	4 50½	3690	41·0	..	36·3	..	..	+4·7				
	4 52	3770	39·7	..	40·5	..	..	−0·8				
	4 52½	3790	40·7	..	41·5	..	..	−0·8				
Aug. 18	1 46	3438	..	..	47·8	47·2	..	..	..	..	..	+0·6
20	6 38	3159	48·9	..	48·0	..	..	+0·9				
	6 41	3816	46·6	..	44·2	..	..	+2·4				
	6 50	3893	44·9	..	44·5	..	..	+0·4				
	6 51½	3693	44·9	..	44·5	..	..	+0·4				
	6 52	3593	44·9	..	44·0	..	..	+0·9				
	6 55	3663	45·1	..	44·0	..	..	+1·1				
	6 56	3693	45·4	..	43·5	..	..	+1·9				
	6 58	3793	44·4	..	43·5	..	..	+0·9				
	7 2	3893	44·7	..	43·0	..	..	+1·7				
	7 10	3405	44·7	..	42·5	..	..	+2·2				
	7 13	3468	45·3	..	45·0	..	..	+0·3				
Sept. 1	5 1	3080	42·8	..	43·0	..	..	−0·2				
	5 3	3257	43·3	..	43·5	..	..	−0·2				
	5 8	3458	38·5	..	38·5	..	..	0·0				
	5 13	3680	37·8	..	38·5	..	..	−0·7				
	5 16	3620	38·4	..	38·4	..	..	0·0				
	5 19	3590	37·0	..	35·0	..	..	+2·0				
	5 20	3583	37·3	..	33·1	..	..	+4·2				
	5 24	3987	36·6	..	35·0	..	..	+1·6				
	5 28	3787	36·6	..	33·0	..	..	+3·6				
	5 37½	3690	37·2	..	37·5	..	..	−0·3				
	5 40	3362	38·4	..	38·0	..	..	+0·4				
5	1 10	3660	41·2	41·3	..	42·0	−0·1	..	−0·8	..	−0·7	

TABLE IX. (*continued.*)

Between 4000 and 5000 feet.

Date.		Height.	Dew-point Temperatures: Calculated from: Dry and Wet (free).	Calculated from: Dry and Wet (aspirated).	Observed by: Daniell's Hygrometer.	Observed by: Regnault's Hygrometer.	Temperature of the Dew-point as determined by Dry and Wet (free) above that by: Dry and Wet (aspirated).	Dry and Wet (free) above that by: Daniell's Hygrometer.	Dry and Wet (free) above that by: Regnault's Hygrometer.	Dry and Wet (aspirated) above that by: Daniell's Hygrometer.	Dry and Wet (aspirated) above that by: Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
d	h m	feet.	°	°	°	°	°	°	°	°	°	°
July 30	4 56	4169	40·3	..	41·5	..	..	−1·2				
	4 56¾	4279	39·7	..	41·2	..	..	−1·5				
	5 1½	4104	40·2	..	43·1	..	..	−2·9				
	5 3	4324	40·7	..	43·1	..	..	−2·4				
	5 4½	4403	39·8	..	41·0	..	..	−1·2				
	5 7½	4613	36·5	..	40·5	..	..	−4·0				
	5 9½	4683	38·1	..	39·5	..	..	−1·4				
	5 14	4863	37·3	..	39·5	..	..	−2·2				
	5 16	4873	38·0	..	39·0	..	..	−1·0				
	5 16½	4923	37·6	..	39·5	..	..	−1·9				
	6 21	4950	37·0	..	39·0	..	..	−2·0				
	6 22	4450	38·8	..	40·0	..	..	−1·2				
Aug. 20	6 42	4116	45·9	..	44·2	..	..	+1·7				
	6 48	4316	43·8	..	44·5	..	..	−0·7				
	6 49	4116	45·7	..	44·5	..	..	+1·2				
	6 49½	4055	46·4	..	45·0	..	..	+1·4				
	7 5	4250	43·8	..	43·0	..	..	+0·8				
	7 7	4384	43·0	..	44·0	..	..	−1·0				
	7 8	4354	43·7	..	43·5	..	..	+0·2				
Sept. 1	5 31	4090	36·4	..	35·5	..	..	+0·9				
	5 33	4190	36·1	..	34·0	..	..	+2·1				
5	1 11½	4388	..	39·3	..	38·5	..	..	..	..	+0·8	
8	5 25	4829	45·7	..	43·0	..	..	+2·7				

Between 5000 and 6000 feet.

Date.		Height.	Calc. Dry and Wet (free).	Calc. Dry and Wet (aspirated).	Obs. Daniell's Hygrometer.	Obs. Regnault's Hygrometer.	Free above: Dry and Wet (aspirated).	Free above: Daniell's Hygrometer.	Free above: Regnault's Hygrometer.	Aspirated above: Daniell's Hygrometer.	Aspirated above: Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
July 17	9 51	5802	33·8	..	30·5	..	..	+3·3				
30	5 18	5220	37·3	..	39·0	..	..	−1·7				
	5 21	5360	37·2	..	40·5	..	..	−3·3				
	5 22	5200	38·9	..	40·0	..	..	−1·1				
	5 23½	5200	37·2	..	42·0	..	..	−4·8				
	5 24	5330	38·7	..	40·2	..	..	−1·5				
	5 24½	5450	35·9	..	38·0	..	..	−2·1				
	5 26	5830	35·8	..	38·2	..	..	−2·4				
	5 28½	5530	35·4	..	36·2	..	..	−0·8				
	5 31½	5280	38·4	..	36·5	..	..	+1·9				
	5 39	5983	35·8	..	38·0	..	..	−2·2				
	5 47	5577	36·4	..	36·0	..	..	+0·4				
	5 50	5846	34·7	..	35·5	..	..	−0·8				
Aug. 18	1 38	5820	44·6	..	..	37·5	..	..	+7·1			
	1 55	5019	44·5	..	42·0	..	..	+2·5				
Sept. 5	1 13	5675	36·5	..	38·0	..	..	−1·5				
8	5 17½	5230	38·0	..	42·0	..	..	−4·0				

TABLE IX. (*continued.*)

Between 6000 and 7000 feet.

Date.	Height.	Dew-point Temperatures: Calculated from: Dry and Wet (free).	Dew-point Temperatures: Calculated from: Dry and Wet (aspirated).	Dew-point Temperatures: Observed by: Daniell's Hygrometer.	Dew-point Temperatures: Observed by: Regnault's Hygrometer.	Temperature of the Dew-point as determined by: Dry and Wet (free) above that by: Dry and Wet (aspirated).	Dry and Wet (free) above that by: Daniell's Hygrometer.	Dry and Wet (free) above that by: Regnault's Hygrometer.	Dry and Wet (aspirated) above that by: Daniell's Hygrometer.	Dry and Wet (aspirated) above that by: Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
d h m	feet.	°	°	°	°	°	°	°	°	°	°
July 30 5 41	6370	34·0	..	36·0	..	..	−2·0				
5 43	6370	32·7	..	34·0	..	..	−1·3				
5 52	6102	33·1	..	36·0	..	..	−2·9				
6 0	6937	30·3	..	32·0	..	..	−1·7				
6 1	6867	32·0	..	31·5	..	..	+0·5				
6 2	6547	31·4	..	32·0	..	..	−0·6				
6 11½	6937	30·0	..	32·0	..	..	−2·0				
6 13	6917	30·0	..	32·0	..	..	−2·0				
6 14	..	30·8	..	31·8	..	..	−1·0				
6 18	6400	32·7	..	31·0	..	..	+1·7				
6 18½	6000	32·8	..	32·0	..	..	+0·8				
Sept. 5 1 17	6914	..	36·0	..	35·5	..	..	..	..	+0·5	

Between 7000 and 8000 feet.

Aug. 18 1 27	7836	41·8	..	..	34·0	..	..	+7·8			
1 32	7650	40·6	..	35·5	35·0	..	+5·1	+5·6	..	..	+0·5
1 33	7650	42·0	..	..	36·6	..	..	+5·4			

Between 8000 and 9000 feet.

July 17 9 55	8809	19·7	..	..	24·0	..	..	−4·3			
Aug. 18 2 11¾	8771	..	36·7	..	38·5	..	..	..	..	−1·8	

Between 9000 and 10,000 feet.

July 17 11 40	9882	19·9	19·7	..	..	+0·2					
Aug. 18 1 18¾	9954	29·2	..	30±	..	..	−0·8				
1 24	9884	..	29·9	24·0	..	..	..	..	+5·9		

Between 10,000 and 11,000 feet.

Aug. 18 1 22	10840	28·6	..	22·0	25·0	..	+6·6	+3·6	..	..	−3·0
2 17	10864	27·4	31·0	..	29·5	−3·6	..	−2·1	..	+1·5	
Sept. 5 1 22	10774	28·9	..	..	25·0	..	..	+3·9			

TABLE IX. (*continued.*)

Between 11,000 and 12,000 feet.

Date.	Height.	Dew-point Temperatures: Calculated from: Dry and Wet (free).	Dew-point Temperatures: Calculated from: Dry and Wet (aspirated).	Dew-point Temperatures: Observed by: Daniell's Hygrometer.	Dew-point Temperatures: Observed by: Regnault's Hygrometer.	Temperature of the Dew-point as determined by: Dry and Wet (free) above that by: Dry and Wet (aspirated).	Dry and Wet (free) above that by: Daniell's Hygrometer.	Dry and Wet (free) above that by: Regnault's Hygrometer.	Dry and Wet (aspirated) above that by: Daniell's Hygrometer.	Dry and Wet (aspirated) above that by: Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
d h m	feet.	°	°	°	°	°	°	°	°	°	°
July 17 10 2	11792	23·9	..	..	25·0	..	..	−1·1			

Between 12,000 and 13,000 feet.

July 17 10 3	12709	..	..	19·5	21·0	..	..	..	..	..	−1·5
Aug. 18 2 21	12364	22·2	22·2	..	29·0	0·0	..	..	..	− 6·8	
3 36	12453	12·6	..	..	14·0	..	..	−1·4			
Sept. 5 1 24	12568	..	14·5	..	(25·0)	..	..	..	..	−10·5	

Between 13,000 and 14,000 feet.

July 17 10 4	13000	16·9	..	21·0	22·0	..	−4·1	−5·1	..	..	−1·0
10 5	13467	24·9	..	..	22·5	..	..	+2·4			
Aug. 18 3 34	13320	..	9·8	..	12·5	..	..	..	..	−2·7	

Between 14,000 and 15,000 feet.

July 17 10 8	14544	24·0	26·7	20·5	24·0	−2·7	+3·5	0·0	+6·2	+2·7	−3·5

Between 15,000 and 16,000 feet.

July 17 10 11	15704	24·6	22·7	22·0	21·5	+1·9	+2·6	+3·3	+0·7	+1·4	+0·7

Between 16,000 and 17,000 feet.

July 17 10 15	16914	24·3	19·8	23·0	20·8	+4·5	+1·3	+3·5	−3·2	−1·0	+2·2
Aug. 18 2 31	....	..	−0·7	..	6·0	..	..	..	..	−6·7	

Between 17,000 and 18,000 feet.

Aug. 18 2 32½	....	18·8	..	−1·4	..	..	+20·2				
2 34⅓	....	24·0	..	..	3·5	..	..	+20·5			

Between 18,000 and 19,000 feet.

July 17 10 25	18844	24·9	24·4	25·1	24·2	+0·5	−0·2	+0·7	−0·7	+0·2	+0·9
Aug. 18 2 35	18039	..	− 5·4	..	3·0	..	..	..	..	−8·4	
2 36	....	..	−11·5	..	0·0	..	..	..	..	−11·5	

TABLE IX. (*continued.*)

Between 19,000 and 20,000 feet.

Date.	Height.	Dew-point Temperatures: Calculated from Dry and Wet (free).	Calculated from Dry and Wet (aspirated).	Observed by Daniell's Hygrometer.	Observed by Regnault's Hygrometer.	Temperature of the Dew-point as determined by Dry and Wet (free) above that by Dry and Wet (aspirated).	Dry and Wet (free) above that by Daniell's Hygrometer.	Dry and Wet (free) above that by Regnault's Hygrometer.	Dry and Wet (aspirated) above that by Daniell's Hygrometer.	Dry and Wet (aspirated) above that by Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
d h m	feet.	°	°	°	°	°	°	°	°	°	°
July 17 10 27	19374	25·6	23·2	22·6	21·0	+2·4	+3·0	+4·6	+0·6	+2·2	+1·6
10 29	19415	19·5	21·4	..	22·2	−1·9	..	−2·7	..	−0·8	
10 30	19415	21·8	18·3	21·5	22·2	+3·5	+0·3	−0·4	−3·2	−3·9	−0·7
10 35	19548	16·6	..	19·0	20·0	..	−2·4	−3·4	..	..	−1·0
10 39	19380	23·8	..	20·0	21·1	..	+3·8	+2·7	..	..	−1·1
10 44	19336	22·1	22·1	20·5	20·5	0·0	+1·6	+1·6	+1·6	+1·6	0·0
Sept. 5 1 37¾	19000+	−13·0	..	−10·0	..	..	−3·0				
Between 20,000 and 21,000 feet.											
Sept. 5 1 40¼	20000+	−8·2	..	..	−15·0	..	..	+6·8			

By taking the mean of each column of differences in each 1000 feet of elevation, the next Table is formed.

TABLE X.—Showing the mean differences between the Temperatures of the Dew-point as found by the use of the Dry- and Wet-bulb Thermometers and by Daniell's and Regnault's Hygrometers, and comparison of the results as found from the two Hygrometers.

Heights between	Excess of Temperature of the Dew-point as found by Dry and Wet Thermometers (free) above that found by Dry and Wet Bulbs (aspirated).	No. of obs.	Daniell's Hygrometer.	No. of obs.	Regnault's Hygrometer.	No. of obs.	Dry and Wet (aspirated) above that found by Daniell's Hygrometer.	No. of obs.	Regnault's Hygrometer.	No. of obs.	Daniell's Hygr. above that by Regnault's Hygrometer.	No. of obs.
feet. feet.	°		°		°		°		°		°	
0 to 1000	0·0	2	+1·1	8	+2·6	2	+0·2	2	+2·6	2	+2·3	2
1000 „ 2000	...	...	+0·2	7								
2000 „ 3000	+1·9	1	+0·5	11	+4·0	1	...	...	+2·1	1		
3000 „ 4000	−0·1	1	+1·1	25	...	...	...	...	−0·7	1	+0·6	1
4000 „ 5000	...	...	−0·6	22	...	...	...	...	+0·8	1		
5000 „ 6000	...	...	−1·2	16	+7·1	1						
6000 „ 7000	...	...	−0·9	11	...	...	...	...	+0·5	1		
7000 „ 8000	...	...	+5·1	1	+6·3	3	...	...	...	...	+0·5	1
8000 „ 9000	...	...	...	...	−4·3	1	...	...	−1·8	1		
9000 „ 10000	+0·2	1	−0·8	1	...	...	+5·9	1				
10000 „ 11000	−3·6	1	+6·6	1	−1·8	3	...	...	+1·5	1	−3·0	1
11000 „ 12000	...	...	...	...	−1·1	1						
12000 „ 13000	0·0	1	...	...	−1·4	1	...	...	−8·6	2	−1·5	1
13000 „ 14000	...	...	−4·1	1	−1·3	2	...	...	−2·7	1	−1·0	1
14000 „ 15000	−2·7	1	+3·5	1	0·0	1	+6·2	1	+2·7	1	−3·5	1
15000 „ 16000	+1·9	1	+2·6	1	+3·3	1	+0·7	1	+1·4	1	+0·7	1
16000 „ 17000	+4·5	1	+1·3	1	+3·5	1	−3·2	1	−3·9	2	+2·2	1
17000 „ 18000												
18000 „ 19000	+0·5	1	−0·2	1	+0·7	1	−0·7	1	−6·6	3	+0·9	1
19000 „ 20000	+1·0	4	+0·5	6	+0·4	6	−0·3	3	−0·2	4	−0·2	5

The numbers in every one of these columns are affected with a change of sign, and, therefore, no certain difference is shown over the determination of the dew-point as found by any method or instrument over that found by any other.

By taking the means of all in each group of 5000 feet, giving weight according to the number of experiments upon which each result is based, we have:—

From the ground to 5000 feet high the temperature of the dew-point as determined by—

Dry and Wet bulb (free)

		Experiments.
Was 0°·4 higher than as found by Dry and Wet (aspirated) . . from		4
„ the same as found by Daniell's Hygrometer	„	73
„ 2°·2 higher than as found by Regnault's Hygrometer . .	„	3

Dry and Wet bulb (aspirated)

Was 0°·1 higher than as found by Daniell's Hygrometer	„	2
„ 1°·0 „ „ „ Regnault's „	„	5

Daniell's Hygrometer

Was 1°·0 higher than as found by Regnault's Hygrometer . .	„	3

From 5000 feet to 10,000 feet the temperature of the dew-point as determined by

Dry and Wet (free)

Was 0°·2 higher than as found by Dry and Wet (aspirated) . . from		1
„ 0°·1 „ „ „ Daniell's Hygrometer	„	29
„ 1°·8 „ „ „ Regnault's „	„	5

Dry and Wet (aspirated)

Was 5°·9 higher than as found by Daniell's Hygrometer	„	2
„ 0°·7 lower „ „ Regnault's „	„	1

From 10,000 to 15,000 feet the temperature of the dew-point as determined by

Dry and Wet (free)

Was 2°·1 lower than as found by Dry and Wet (aspirated) . . from		3
„ 2°·0 higher „ „ Daniell's Hygrometer	„	3
„ 0°·7 lower „ „ Regnault's „	„	8

Dry and Wet (aspirated)

Was 6°·2 higher than as found by Daniell's Hygrometer	„	1
„ 1°·4 lower „ „ Regnault's „	„	5

Daniell's Hygrometer

Was 2°·2 lower than as found by Regnault's Hygrometer	„	4

From 15,000 to 20,000 feet the temperature of the dew-point as determined by

			Experiments.
Dry and Wet (free)			
Was 1°·1 higher than as found by	Dry and Wet (aspirated)	..from	7
„ 0°·5 „ „ „	Daniell's Hygrometer	„	9
„ 0°·9 „ „ „	Regnault's „	„	9
Dry and Wet (aspirated)			
Was 0°·6 lower than as found by	Daniell's Hygrometer.......	„	6
„ 0°·9 „ „ „	Regnault's „	„	10
Daniell's Hygrometer			
Was 0·4 higher than as found by	Regnault's Hygrometer....	„	8

By taking the mean of all, according to the number of experiments, we have:—

From the ground to 20,000 feet the mean temperature of the dew-point as found by

Dry and Wet (free)			
Was 0°·2 higher than as found by	Dry and Wet (aspirated)	..from	15
„ 0°·1 „ „ „	Daniell's Hygrometer	„	114
„ 0°·7 „ „ „	Regnault's „	„	25
Dry and Wet (aspirated)			
Was 0°·9 higher than as found by	Daniell's Hygrometer	„	10
„ 0°·6 lower „ „	Regnault's „	„	22
Daniell's Hygrometer			
Was 0°·1 lower than as found by	Regnault's Hygrometer ..	„	16

From all the results it would seem that the temperature of the dew-point as deduced from the Dry- and Wet-bulb thermometers as ordinarily used has a tendency to give a result a little too high, but to an amount that is less than the probable error of observations, and that, therefore, it is a perfectly trustworthy instrument to use, even to great altitudes; also, the results by Daniell's Hygrometer seem to be of equal value with those found by Regnault's Hygrometer, at all elevations.

§ 8. Comparison of the Readings of the Mercurial and Aneroid Barometers at different Heights.

All the simultaneous readings of the Siphon and Aneroid Barometers were extracted from Table I. and inserted in the following Table.

Table XI.—Comparison of the Readings of Mercurial and Aneroid Barometers, in the ascents on July 17 and August 18.

Month, day, hour and minute.		Readings of Barometers.		Excess of Reading of Aneroid above Siphon Barometer.	Month, day, hour and minute.		Readings of Barometers.		Excess of Reading of Aneroid above Siphon Barometer.
		Siphon.	Aneroid.				Siphon.	Aneroid.	
	h m s	in.	in.	in.		h m s	in.	in.	in.
July 17,	9 49 0	25·22	25·32	+0·10	Aug. 18,	0 56 0	29·34	29·51	+0·17
	9 51 0	24·14	24·30	+0·16		1 6 0	28·55	28·78	+0·23
	9 53 0	22·42	22·65	+0·23		1 8 0	26·67	26·90	+0·23
	9 54 0	22·02	22·20	+0·18		1 10 0	25·86	26·08	+0·22
	9 55 0	21·58	21·80	+0·22		1 14 0	23·64	23·82	+0·18
	9 56 0	20·93	21·10	+0·17		1 15 0	22·69	22·68	−0·01
	9 58 0	19·63	20·09	+0·46		1 20 0	19·90	20·05	+0·15
	10 2 0	19·28	19·60	+0·32		1 24 15	20·90	21·28	+0·38
	10 3 0	18·63	18·90	+0·27		1 27 0	22·62	22·90	+0·28
	10 5 0	18·14	18·40	+0·26		1 32 0	22·80	22·85	+0·05
	10 8 0	17·24	17·52	+0·28		1 38 0	24·46	24·60	+0·14
	10 11 0	16·74	17·10	+0·36		1 41 0	25·08	25·30	+0·22
	10 15 0	16·04	16·25	+0·21		1 52 0	25·80	25·82	+0·02
	10 25 0	14·94	15·15	+0·21		1 55 0	25·08	25·25	+0·17
	10 27 0	14·64	15·30	+0·66		2 0 0	23·93	24·10	+0·17
	10 29 0	14·64	15·30	+0·66		2 9 0	22·58	22·71	+0·13
	10 30 0	14·64	15·30	+0·66		2 17 0	20·24	20·50	+0·26
	10 35 0	14·64	15·00	+0·36		2 21 0	19·11	19·30	+0·19
	10 44 0	14·63	15·10	+0·47		2 25 20	17·61	17·85	+0·24
	10 47 0	14·13	14·70	+0·57		2 29 0	16·41	16·50	+0·09
	10 50 0	13·64	14·20	+0·56		2 32 20	15·84	16·00	+0·16
	10 54 0	13·14	13·60	+0·46		2 49 50	13·70	13·60	−0·10
	10 57 0	12·14	12·60	+0·46		3 5 0	12·93	13·20	+0·27
	11 3 0	11·64	12·10	+0·46		3 18 30	13·45	13·55	+0·10
	11 7 0	11·65	12·10	+0·45		3 25 0	13·65	13·72	+0·07
	11 12 0	11·95	12·40	+0·45		3 34 +	17·53	17·42	−0·11
	11 20 0	12·65	13·20	+0·55		3 36 0	18·63	18·65	+0·02
	11 25 0	13·14	13·60	+0·46		3 39 0	20·02	20·05	+0·03
	11 38 0	18·94	19·00	+0·06		3 49 0	24·28	24·42	+0·14
	11 39 0	20·04	20·40	+0·36					
	11 40 0	20·54	20·80	+0·26					

July 17.—The differences between the readings are shown in the last column, and exhibit an increasing difference, increasing in amount with decreasing readings, till at the highest point the discordance between the readings amounted to half an inch. It is presumed that the aneroid barometer was in error to these amounts; but both instruments were broken in the descent, and no more information can be given.

August 18.—The differences between the readings of the mercurial and aneroid barometers in this ascent were as constant as could be expected, as the readings could seldom be strictly simultaneous. Upon the whole, the readings of the aneroid are as good as those of the siphon.

TABLE XI. (*continued*).—Comparison of the Readings of Mercurial and Aneroid Barometers and Negretti's new Barometer, in the Ascent on September 5.

Month, day, hour and minute.	Readings of Barometers.			Excess of Reading of Aneroid above Siphon Barometer.	Excess of Reading above Negretti's new Barometer	
	Siphon.	Aneroid.	Negretti's new Barometer.		of Siphon Barometer.	of Aneroid Barometer.
h m s	in.	in.	in.	in.	in.	in.
Sept. 5, 0 0 0	29·40	29·40	......	0·00		
1 5 10	28·97	29·10	......	+0·13		
1 5 30	28·57	28·60	28·72	+0·03	−0·15	−0·12
1 6 0	28·38	28·35	28·55	−0·03	−0·17	−0·20
1 10 0	26·19	26·20	26·35	+0·01	−0·16	−0·15
1 11 30	25·49	25·62	......	+0·13		
1 13 0	24·30	24·45	24·60	+0·15	−0·30	−0·15
1 14 30	23·70	23·90	23·90	+0·20	−0·20	0·00
1 16 0	23·36	23·40	......	+0·04		
1 17 40	22·66	22·71	22·75	+0·05	−0·09	−0·04
1 21 0	20·72	20·60	20·65	−0·12	+0·07	−0·05
1 22 0	20·07	20·17	......	+0·10		
1 25 30	17·93	18·10	17·90	+0·17	+0·03	+0·20
1 27 0	16·94	16·90	16·90	−0·04	+0·04	0·00
1 28 0	16·69	16·65	......	−0·04		
1 35 0	14·65	14·90	......	+0·25		
1 36 0	14·55	14·80	......	+0·25		
1 37 30	14·47	14·80	......	+0·33		
2 8 30	12·55	12·80	......	+0·25		
2 9 30	16·37	16·45	16·50	+0·08	−0·13	−0·05
2 9 40	17·07	......	17·20	....	−0·13	
2 11 0	17·71	......	17·85	....	−0·14	
2 16 10	19·75	19·90	19·90	+0·15	−0·15	0·00
2 16 20	20·05	20·25	20·25	+0·20	−0·20	0·00
2 16 50	20·65	20·65	20·70	0·00	−0·05	−0·05
2 17 30	21·15	21·55	21·30	+0·40	−0·15	+0·25
2 19 30	21·85	21·90	21·90	+0·05	−0·05	0·00
2 20 20	22·04	......	22·00	....	+0·04	
2 20 40	22·24	22·20	22·45	−0·04	−0·21	−0·25
2 23 20	22·64	22·76	22·70	+0·12	−0·06	+0·06
2 23 50	22·93	23·20	23·00	+0·27	−0·07	+0·20
2 24 0	23·03	23·00	22·95	−0·03	+0·08	+0·05
2 32 0	25·40	25·55	25·30	+0·15	+0·10	+0·25
2 38 0	26·40	26·35	26·35	−0·05	+0·05	0·00
3 6 0	......	29·02	29·20	....	....	−0·18

The numbers in the last column but two show the differences between the readings of the siphon and aneroid barometers, those in the last column but one the differences between the readings of the siphon barometer and Negretti and Zambra's new barometer, and those in the last column the differences between the readings of the aneroid barometer and Negretti and Zambra's new barometer; these several differences are all small, and are within the probable error of observation, as it is not possible that the readings can be made at the same instant. They prove that all the observations made in the several ascents may safely be depended upon, and also that an aneroid barometer can be made to read correctly to pressures below 12 inches.

§ 9. ELECTRICAL STATE OF THE ATMOSPHERE.

In the ascent on July 17, an electrometer, kindly lent by Professor W. Thomson, of Glasgow, was used. Care (according to the instructions from Professor Thomson) was taken to discharge the electricity from the balloon on leaving the earth, and a charge of negative electricity was given to the instrument, and it read 59°, which we may call the balloon-reading. The instrument leaked a little, and it was necessary at every experiment to re-determine the balloon-reading. The following are the results of the observations:—

		°
At 13,500 feet..	Balloon-reading	59
	Electricity of the air ..	64
At 14,500 feet..	Balloon-reading	59
	Electricity of the air ..	63
At 15,700 feet..	Balloon-reading	59
	Electricity of the air ..	63
At 19,500 feet..	Balloon-reading	58
	Electricity of the air ..	61
At 19,300 feet..	Balloon-reading	58
	Electricity of the air ..	$60\frac{1}{4}$
At 23,000 feet..	Balloon-reading	58
	Electricity of the air ..	58+

Now as these observations were made under the balloon, and the readings for the air were large negative readings always, it implies that the air was charged with positive electricity, but becoming less and less in amount with increasing elevation, till at the height of 23,000 feet the amount was too small to measure but was of the same kind. It is impossible therefore to say whether at higher elevations there would have been no electricity, or whether it would have changed to negative. I wish, however, to speak guardedly on this subject, and would regard these observations as indications only. I pledge myself no further than that all the directions given to me by Professor Thomson were followed, and that the readings are correct.

ON THE OXYGENIC CONDITION OF THE ATMOSPHERE.

On July 17th the test papers, both by Moffat and Schönbein, continued untinged by colour throughout the whole flight of the balloon, and the same result was found during the ascent on July 30.

After these ascents I received the following letter from Dr. Moffat:—

"Hawarden, August 4th, 1862.

DEAR MR. GLAISHER,

"In the *Times* of Saturday last I observed, in your report of meteorological observations taken during a balloon ascent from the Crystal Palace on July 30th, that 'test ozone papers were not coloured, and no ozone was noticed in the ascent from Wolverhampton.' This is remarkable, seeing that ozone increases in quantity directly with increase of elevation on the earth's surface. The degree of coloration of test papers varies with the humidity of the atmosphere. Dry air retards the decomposition of the iodine of potassium, and very moist air removes the iodine when decomposition has taken place. It does not appear, however, in the observations, that the degree of humidity on the day of ascent was in any way unfavourable to the decomposition of the iodine, or the development of the brown colour on the test papers.

"The time the balloon was up was short (two hours), and ozone must be in very considerable quantity to produce coloration of the test paper in so short a period of time. Still, according to our present notions of increase of the quantity of ozone with increase of elevation, papers of ordinary sensitiveness ought to have been coloured during the ascents. The sensitiveness of the papers used in the investigation is of course of the utmost importance.

"Today the quantity of ozone indicated by test papers prepared by myself is 4; and two papers from a packet prepared by Messrs. Negretti and Zambra, exposed for *two hours in sunshine*, did not show the slightest tinge, while a slip prepared by myself, exposed under similar circumstances, gave a degree of coloration equal to the mean of the day. From these results it would appear that the test papers used by you were in fault. This is a question of some moment, and one of great scientific interest; and if future balloon ascents give results similar to those you have reported, then the ground of the *development* of ozone must be looked for in the atmosphere near the surface of the earth.

"I am, yours very truly,

"*Jas. Glaisher, Esq.*" (Signed) "T. MOFFAT."

In consequence of the receipt of this letter I went to Hawarden to Dr. Moffat, and induced him to make some test papers himself for the balloon experiments. He did so, and they were used on August 18th. I took some of the papers prepared by him, and some of the papers out of the same packets which I had used during the two preceding ascents, as well as some prepared by a formula of Schönbein. When I had reached 10,000 feet the new papers were decidedly tinged; at 17,000 feet they were coloured to the amount of 2, on a scale whose deepest colour is represented by 10; at 20,000 feet to 3. At 22,000 feet the coloration had increased to 4; and here Schönbein's paper was coloured to 1, and Moffat's old papers were still uncoloured. Moffat's new papers gradually increased in intensity, and when 3000 feet from the earth at $2^h 38^m$ were deepened to 7. It would therefore appear that in all probability the test papers were in fault in the first ascents; and I may here remark that, in consequence, the preparation of the ozone test papers has been stopped, and that it is my intention, as Dr. Moffat himself cannot undertake the task, to superintend the preparation of the papers myself in future.

TIME OF VIBRATION OF A MAGNET.

On July 17, at Wolverhampton, there were

30 vibrations of a magnet in	42·1 s.;	that is, one vibration in	1·403 s.
30 „ „	42·5;	„ „	1·417
30 „ „	42·4;	„ „	1·413

Therefore one vibration =1·411 second.

At the height of 18,844 feet one vibration = 1^s·489.
At the height of 20,244 feet one vibration = 1^s·536.

Therefore the time of vibration seemed to be somewhat longer.

On July 30, at the Royal Observatory, Greenwich, the time of the vibration of the magnet =1·573 second.

On July 30, the mean of four sets of observations at the mean height of 5300 feet gave

One vibration =1^s·572,

being sensibly the same as the result on the same day as determined at the Observatory.

On August 18, at Wolverhampton,

38 vibrations	=60·0 s.	∴ one vibration	=1·580 s.
32 „	50·3	„ „	1·572
34 „	54·2	„ „	1·595
30 „	47·9	„ „	1·597
			4)6·344
			1·586

Therefore one vibration=1·586 second.

At 11,000 feet 26 vibrations =41·5 second.
Therefore one vibration= 1·590 second.

A result differing but little from that on the ground.

August 20, at the Royal Observatory, Greenwich, the time of one vibration was 1·580 second.

August 20, at the height of 3800 feet one vibration =1·583 second.

On September 5, I did not succeed in getting the time of vibration of the magnet at all in the balloon. During this ascent we were almost constantly going round and round—a motion fatal to observations of this nature, and failure at all times was the rule in these experiments. I commenced many series of experiments with the axis of the car in one position relative to the cardinal points of the compass, which I found to be different before the observations were completed, and consequently the observations were of no value.

The general result of these experiments is that the magnet vibrates in a somewhat longer interval of time at high elevations than on the earth. The number of experiments, however, is too few to speak decidedly on this point.

HEIGHTS AND APPEARANCE OF THE CLOUDS.

July 17.

The sky was covered with cumulostratus clouds before starting.

At $9^h 47^m$ a.m., at 4467 feet. Clouds were reached.

At $9^h 51^m$ a.m., at 5802 feet. Many clouds all round at a lower elevation.

At $9^h 53^m$ a.m., at 7980 feet. Entered a dense cumulostratus cloud.

At $9^h 55^m$ a.m., at 9000 feet. Passed out of cloud into bright sunshine and blue sky

At $10^h 2^m$ a.m., at 11,792 feet. Examined the clouds below, which were noted as being very beautiful in form and arrangement.

At $10^h 15^m$ a.m., at 16,914 feet. Cumuli were underneath and far below; strati in the distance, apparently the same height as the eye. No clouds above: blue sky.

At $11^h 38^m$ a.m., at 12,376 feet. On descending the shadow of the balloon and car on the cloud below was very large and distinct; entered the cloud directly afterwards.

At $11^h 40^m$ A.M., at 9882 feet. In so dense a cloud that the balloon could not be seen.

At $11^h 45^m$ A.M., at 5432 feet. Came out of cloud, but passed through others which appeared to be rising with great rapidity.

July 30.

Partially clear before starting, there being cirrocumulus, cumulostratus, cirrostratus, and a little cirrus nearly covering the sky, but very thin in the zenith.

At 5^h 26^m p.m., at 5830 feet. Cumuli all round at lower elevations; zenith clear.

At 5^h 54^m p.m., at 6466 feet. A great mist, surrounding the balloon.

At 6^h 2^m p.m., at 6547 feet. Cumuli and cumulostratus were below.

At 6^h 7^m p.m., at 6600 feet. Cumuli and cumulostratus appeared at the same level with the car, and strati above.

August 18.

At 1^h p.m. Zenith clear, wind W.N.W. but light, clouds moving N. by W.

At 1^h 8^m p.m., at 3347 feet. A cumulus cloud was entered.

At 1^h 24^m p.m., at 9884 feet. Detached cumuli far below; plains of clouds in the distance.

At 1^h 27^m p.m., at 7836 feet. Alpine and dome-like clouds, bright and even on one side, in shade and lumpy on the other; detached cumuli at a lower elevation.

At 1^h 34^m p.m., at 6000 feet. Clouds have a very beautiful appearance.

At 1^h 58^m 40^s p.m., at 5800 feet. Cumuli apparently same height as the car in the distance.

At 2^h 22^m 30^s p.m., at 12,700 feet. Great mass of clouds to the east.

At 2^h 25^m 20^s p.m., at 14,300 feet. A sea of clouds; snow-white appearance; a few clouds below; cirri still much higher. A deep-blue sky.

For note on the appearance of the clouds at 3^h 33^m p.m., see Section of Observations, &c., p. 400.

At 3^h 43^m p.m., at 8144 feet. The shadow of the balloon and car on the cloud below very large and distinct.

At 3^h 43^m 30^s p.m., at 7438 feet. Entered clouds.

At 3^h 46^m 10^s p.m., at 6050 feet. In cloud, can see nothing; passed out of cloud at 6000 feet; a lower stratum of cloud.

At 3^h 46^m 30^s p.m., at 5979 feet. Image of balloon on lower clouds magnificent.

At 3^h 48^m p.m., at 5922 feet. Entered a second stratum of cloud.

At 3^h 49^m p.m., at 5621 feet. Still in cloud.

At 3^h 50^m p.m., at 5300 feet. Emerged from the clouds.

At 3^h 51^m p.m., at 4520 feet. In thick mist.

At 3^h 55^m p.m., at 3000 ± feet. Passed out of mist.

August 20.

At 6^h 30^m p.m. Very hazy; cirri prevalent in zenith; cloudy elsewhere.

At 6^h 32^m 30^s p.m., at 1397 feet. In a mist.

At 6^h 38^m p.m., at 3159 feet. Misty all round, detached scud beneath.

At 6^h 39^m p.m., at 3359 feet. Clouds below as scud.

At 6^h 43^m p.m., at 4256 feet. Clouds far below, but not under us.

At 6^h 43^m 30^s p.m., at 4316 feet. Entered a cloud.

At 6^h 58^m p.m., at 3793 feet. Clouds were all below.

At 7^h 5^m p.m., at 4250 feet. In mist; earth invisible.

At 7^h 25^m p.m., at 2067 feet. Fog below.

At 7^h 47^m p.m., at 5194 feet. In cloud; London out of sight.

At 7^h 49^m p.m., at 5900 feet. Having passed above the clouds, their upper surfaces were of a rich red.

At 7^h 50^m p.m., at 5500 feet. In cloud.

At 7^h 52^m p.m., at 5200 feet. Above the clouds again.

At 7^h 55^m p.m., at 5500 feet. Setting sun tinged the clouds with red; a beautiful appearance.

At 7^h 56^m p.m., at 5160 feet. In cloud again.

At 8^h 5^m p.m., at 7000 feet. Above the clouds.

August 21.

The sky was overcast, being covered with dense cirrostratus clouds before starting.

At 4^h 40^m a.m., at 1210 feet. In a thick mist.

At 4^h 41^m a.m., at 1286 feet. Clouds broken; in the east there were beautiful lines of light, with gold and silver tints.

At 4^h 44^m a.m., at 1706 feet. Earth visible in the distance.

At 4^h 45^m a.m., at 2000 feet. Very misty; blocks of clouds above.

At 4^h 49^m a.m., at 2930 feet. Scud below, creeping along the earth; cumuli apparently on same level in the distance; black clouds above.

At 4^h 55^m a.m., at 4927 feet. Entered the clouds.

At 4^h 56^m a.m., at 5300 feet. Lost sight of earth.

At 4^h 57^m 30^s a.m., at 5989 feet. Great masses of alpine cloud; entered a beautiful cumulus cloud.

At 4^h 58^m a.m., at 6000 + feet. In cloud, surrounded by white mist.

At 5^h a.m., at 6510 feet. Emerged in a valley between two clouds.

At 5^h 1^m a.m., at 6400 ± feet. Immense ocean of cloud; magnificent view.

At 5^h 1^m 20^s a.m., at 6350 ± feet. Under the sun the appearance of a lake; mountains of clouds to the left; fine cloud-land generally.

At 5^h 3^m a.m., at 6336 feet. Lost sight of sun; misty.

At 5^h 4^m a.m., at 6413 feet. Deep ravines and shaded parts visible in the clouds; sun again rising in same magnificent way; clouds sweeping boldly away.

At 5^h 34^m 30^s a.m., at 13,875 feet. Magnificent peaks of cloud in the distance; like a sea of cotton.

At 5^h 48^m a.m., at 14,273 feet. Sea of clouds below.

At 5^h 51^m a.m., at 14,318 feet. Thin strati obscure the sun.

At 5^h 57^m a.m., at 14,228 feet. Strati apparently same height as ourselves; cirri above.

At 6^h a.m., at 14,213 feet. Beautiful sea of clouds everywhere.

At 6^h 24^m a.m., at 8040 feet. The shadow of the balloon on the clouds below was distinct, and surrounded by prismatic colours.

At 6^h 27^m a.m., at 7293 feet. Clouds approached on descending.

At 6^h 28^m 30^s a.m., at 7106 feet. In a mist.

At 6^h 29^m a.m., at 7001 feet. Just entering clouds.

At 6^h 35^m a.m., at 5189 feet. Stratum of cloud beneath.

At 6^h 36^m 30^s a.m., at 5058 feet. }
At 6^h 38^m ± a.m., at 4000 ± feet. } Entered the clouds, and passed below them.

September 1.

The sky was uniformly covered with cirrostratus clouds.

At 5^h 5^m 30^s p.m., at 3408 feet. Cumuli in horizon apparently at a low elevation.

At 5^h 16^m p.m., at 3620 feet. Apparently on a level with cumuli in the distance.

At 5^{h} 30^{m} p.m., at 4000 feet. Higher than all clouds near us.

At 5^{h} 31^{m} p.m., at 4090 feet. Clouds have formed over the river from the Nore up to beyond Richmond, following the river in all its windings and bendings, and almost confined to its banks throughout.

At 5^{h} 32^{m} p.m., at 4180 feet. Clouds far below, and moving apparently at right angles to our motion.

At 5^{h} 36^{m} p.m., at 4000 feet. Clouds meeting us, moving at right angles to our motion; clouds very low.

At 5^{h} 37^{m} p.m., at 3900 feet. Clouds passing quickly below us.

At 5^{h} 37^{m} 30^{s} p.m., at 3690 feet. Clouds still follow the course of the river, being limited to its breadth, and parallel to it throughout its course.

At 5^{h} 40^{m} p.m., at 3362 feet. Clouds meeting us of three different degrees of white: the top bluish white, the middle the pure white of the cumulus, and the lower blackish white; and from these, we afterwards learned, rain had been falling on the earth all the afternoon.

September 5.

The sky was covered with clouds before starting.

At 1^{h} 13^{m} 30^{s} p.m., at 5722 feet. In cloud, wholly obscured.

At 1^{h} 16^{m} p.m., at 6729 feet. Still in cloud, very dense.

At 1^{h} 17^{m} 20^{s} p.m., at 6914 feet. Out of cloud.

September 8.

At 4^{h} 48^{m} p.m. The sky was overcast, with cirrostratus clouds.

At 4^{h} 49^{m} p.m., at 1232 feet. Scud at lower elevation, but not under us.

At 4^{h} 54^{m} 30^{s} p.m., at 4169 feet. In mist, then in dense fog.

At 4^{h} 55^{m} p.m., at 4380 feet. In a dense white cloud.

At 4^{h} 56^{m} 30^{s} p.m., at 4650 feet. Still in cloud, thick and white.

At 4^{h} 58^{m} 20^{s} p.m., at 4750 feet. Half out of cloud; the crown of the balloon was out of cloud, and the car still within.

At 4^{h} 59^{m} 10^{s} p.m., at 4650 feet. Cloud more dense; balloon descending.

At 5^{h} 1^{m} 30^{s} p.m., at 4400 feet. Misty view; horizon obscured all round.

At 5^{h} 1^{m} 50^{s} p.m., at 4200 feet. Very black clouds over London.

At 5^{h} 7^{m} p.m., at 3370 feet. Beautiful break in the clouds to the west.

At 5^{h} 10^{m} 30^{s} p.m., at 4108 feet. In slight mist.

At 5^{h} 11^{m} 25^{s} p.m., at 4400 feet. Clouds below.

At 5^{h} 12^{m} 30^{s} p.m., at 4920 feet. The shadow of the balloon and car surrounded by primary and secondary prismatic rings.

At 5^{h} 14^{m} 40^{s} p.m., at 4920 feet. Clouds heaped upon each other, apparently on a level with the car.

At 5^{h} 16^{m} 45^{s} p.m., at 5260 feet. Fluffy clouds below.

At 5^{h} 17^{m} 30^{s} p.m., at 5230 feet. Clouds rising were whiter than those below; a slight amount of blue in all clouds.

At 5^{h} 17^{m} 55^{s} p.m., at 5428 feet. Balloon approaching clouds.

At 5^{h} 18^{m} 30^{s} p.m., at 5428 feet. The shadow of the balloon and car on clouds, encircled by three distinct prismatic rings.

At 5^{h} 20^{m} 30^{s} p.m., at 5112 feet. Clouds near us like smoke.

At 5^{h} 22^{m} p.m., at 5060 feet. Beautiful chasm in the clouds.

At 5^{h} 22^{m} p.m., at 5057 feet. Entering clouds.

At 5^{h} 22^{m} 45^{s} p.m., at 5040 feet. Just entering clouds.

At 5^{h} 24^{m} 10^{s} p.m., at 5020 feet. Entering clouds again.

At 5^{h} 24^{m} 30^{s} p.m., at 5039 feet. In cloud.

At 5^{h} 25^{m} 20^{s} p.m., at 4700 feet. Still in cloud.

At 5^{h} 26^{m} 25^{s} p.m., at 3220 feet. Cumuli below as scud.

At 5^{h} 27^{m} 30^{s} p.m., at 3600 feet. A fine white cloud apparently resting on the Thames, like a huge swan.

Appearance of the Sky.

July 17.

At 10^{h} 15^{m} a.m., at 16,914 feet. Intense prussian blue.

At 10^{h} 39^{m} a.m., at 19,380 feet. Deep blue.

July 30.

At 5^{h} 31^{m} 30^{s} p.m., at 5280 feet. Deep blue, dotted with small cumuli; sun shining brightly.

At 6^{h} 2^{m} p.m., at 6547 feet. Deep blue, dotted with cirrocumuli.

August 18.

At 1^{h} 9^{m} p.m., at 3705 feet. Deep blue.

At 2^{h} 25^{m} 20^{s} p.m., at 14,434 feet. Very deep blue.

At 3^{h} 33^{m} p.m., at 15,984 feet. Very deep blue, dotted with cirrus clouds.

August 20.

At 7^{h} 49^{m} p.m., at 5900 feet. Blue.

September 1.

At 4^{h} 45^{m} p.m., at 270 feet. Blue sky near the horizon.

September 5.

At 1^{h} 21^{m} p.m., at 9926 feet. Deep blue.

September 8.

At 4^{h} 58^{m} 20^{s} p.m., at 4750 feet. Blue sky above.

At 5^{h} 11^{m} 25^{s} p.m., at 4440 feet. Blue.

At 5^{h} 12^{m} 30^{s} p.m., at 4920 feet. Deep blue.

Direction of the Wind.

July 17.

The direction of the wind before starting was S.W.

At 10^{h} 27^{m} a.m., at 19,374 feet, we determined, by means of the compass and the inclination of the grapnel hanging below, that we were moving in the direction of N.E., and therefore the wind was from the S.W.

At 10^{h} 44^{m} a.m., at 19,336 feet, we seemed to be moving towards the north; if so, the wind was S.

July 30.

The direction of the wind before starting was N.W.

At 4^{h} 41^{m} 15^{s} p.m., at 480 feet, the direction of the wind was S.W.

At 5^{h} 17^{m} 30^{s} p.m., at 5155 feet, the direction of the wind was N.N.W.

At 5^{h} 40^{m} 30^{s} p.m., at 6183 feet, the direction of the wind was N.

August 18.

The direction of the wind before starting was N.W. E see p 380

At 1^{h} 5^{m} p.m., at 1130 feet, the direction of the wind was N.N.E.

At 1^{h} 17^{m} p.m., at 8935 feet, the direction of the wind was N.W.

August 20.

The direction of the wind before starting was S.W., with very gentle mo-

tion. No observations of the direction of the wind were made during this ascent, as the air was almost calm.

August 21.

The direction of the wind before starting was S.W. No observations of the direction of the wind were made during this ascent.

September 1.

The direction of the wind before starting was E.N.E., verging to E.
At $5^h\ 4^m$ p.m., at 3268 feet, the direction of the wind was E.N.E.
At $5^h\ 10^m$ p.m., at 3318 feet, the direction of the wind was E.
At $5^h\ 11^m\ 30^s$ p.m., at 3560 feet, the direction of the wind was E.S.E.
At $5^h\ 17^m$ p.m., at 3580 feet, the direction of the wind was E.N.E.
At $5^h\ 36^m$ p.m., at 4190 feet, upper current W.

September 5.

The direction of the wind before starting was N.
At $2^h\ 16^m\ 10^s$ p.m., at 11,150 feet, the direction of the wind was E.

September 8.

The direction of the wind before starting was S.W. No observations of the direction of the wind could be taken during this ascent.

On the Propagation of Sound.

On July 17, when at the height of 11,800 feet above the earth a band was heard playing.

On July 30, at 5450 feet a gun was heard with a sharp sound, then a drum beating, and then a band was heard.

On August 18, at 4500 feet the shouting of people was heard.
„ at 18,000 feet a clap of thunder was heard.
„ at 20,000 feet thunder again heard, below us.
„ at 20,000 feet a loud clap of thunder was heard.

On August 20, at 4000 feet heard the shouts of people.
„ at 4300 feet railway whistle heard.
„ at 3500 feet heard bell tolling.
„ at 2200 feet heard people shouting.
„ at 3700 feet heard a clock strike.

On August 21, at 4900 feet a railway-train was heard.
„ at 8200 feet a gun was heard.
„ at 3500 feet heard people shouting.

On September 5, at 6730 feet, ascending, the report of a gun was heard.
„ at 10,070 feet, descending, the report of a gun was heard.

On September 8, at 3300 feet heard the shouts of people.

From these results we learn that different notes and sounds pass more readily through the air than others. A dog barking has been heard at the height of two miles; a multitude of people shouting, not more than 4500 feet.

On August 18 we heard at three different times what, in my Notes to the Observations, I have called claps of thunder; but I also remarked at these times that a careful examination of the clouds below us failed to discover any thunder-cloud. On inquiry afterwards as to the fact of thunder being heard on the earth, we found none had been, and it was suggested that the sounds we heard might have proceeded from Birmingham, where guns were being proved on that day. It is possible this suggestion may be correct.

Physiological Observations.

On July 17, before starting from Wolverhampton, at my request Mr. Coxwell took the number of his pulsations, and found 74 in one minute; my pulsations were 76 in one minute. At the height of 17,000 feet mine had increased to 100, and Mr. Coxwell's to 84. On regaining the ground the number of both our pulsations was 76.

On August 18, the number of our pulsations were both 76 before starting. At the height of 22,000 feet mine had increased to 100, and Mr. Coxwell's to 98; and afterwards, at a higher elevation, Mr. Coxwell's number was 110, and mine 107.

On August 21, in the morning ascent no observations were taken of our pulsations before leaving. At the height of 1000 feet the following results were obtained:—Mr. Coxwell's, 95 in a minute; Mr. Ingelow's, 80 in a minute; Capt. Percival's, 90 in a minute. At 11,000 feet:—Mr. Coxwell's, 90 in a minute; Mr. Ingelow's, 100 in a minute; Capt. Percival's, 88 in a minute; mine, 88 in a minute; my son's (a boy in his 14th year), 89 in a minute. At 14,000 feet the following were the results:—Mr. Coxwell's, 94 in a minute; mine, 98 in a minute; Mr. Ingelow's, 112 in a minute; Capt. Percival's, 78 in a minute; my son's, 89 in a minute. The pulsations of Capt. Percival were so weak that he could scarcely count them, whilst those of Mr. Coxwell, he considered, had increased in strength.

These results show that the effect of diminished pressure exercises a very different influence upon different individuals, depending probably upon temperament and organization.

In the ascent on July 17, at the height of 19,000 feet the hands and lips were noted as dark bluish, but not the face. At the height of four miles the palpitations of the heart were audible and the breathing was affected, and at higher elevations considerable difficulty was experienced in respiration.

On August 18, the hands and face were blue at the height of 23,000 feet.

On September 5, at the height of about 29,000 feet I became unconscious, and at the height of about 35,000 feet Mr. Coxwell lost the use of his hands. At the height of about 29,000 feet I began to recover, and resumed observing at the height of 25,000 feet.

From these results it would seem that the effect of high elevations is different upon the same individual at different times.

On the Different Appearance of the Gas in the Balloon.

July 17.

Before starting the gas was thick and opaque.
At $9^h\ 54^m$ a.m., at 8065 feet. Valve opened, gas opaque.
At $10^h\ 2^m$ a.m., at 11,792 feet. Balloon full, gas opaque.
At $10^h\ 15^m$ a.m., at 16,914 feet. Gas cleared in balloon from appearance of smoke to transparency.

July 30.

Before starting the gas was thick and opaque.
At $4^h\ 40^m\ 30^s$ p.m., at 330 feet. Gas clear and transparent.

At 4^h 45^m 30^s p.m., at 2379 feet. Gas getting thick again.
At 5^h 31^m p.m., at 5380 feet. Gas partially clear.

August 18.

Before starting the gas was cloudy and opaque.
At 1^h 18^m 55^s p.m., at 9978 feet. Balloon full, gas cloudy.
At 1^h 21^m p.m., at 11,470 feet. Valve opened.
At 1^h 25^m p.m., at 9740 feet. Valve opened.
At 1^h 32^m p.m., at 7650 feet. Valve opened.
At 2^h 22^m p.m., at 12,364 feet. Balloon full, gas clear.
At 2^h 25^m 20^s p.m., at 14,434 feet. Gas getting opaque.

August 20.

Before starting the gas was thick and opaque.
At 6^h 39^m p.m., at 3359 feet. Gas still opaque.
At 6^h 41^m 30^s p.m., at 3986 feet. Gas very opaque, issuing from the neck as smoke.
At 7^h 4^m p.m., at 4052 feet. Gas opaque, issuing from the neck as smoke.
At 7^h 18^m p.m., at 1417 feet. Gas clear; can see netting plainly through the balloon.
At 7^h 22^m p.m., at 1587 feet. Gas issuing from the neck of the balloon; still clear.
At 7^h 25^m p.m., at 2067 feet. Gas clear.
At 7^h 37^m p.m., at 2603 feet. Gas opaque.
At 7^h 52^m p.m., at 5200 feet. Gas opaque.

August 21.

Before starting the gas was thick and opaque.
At 5^h 35^m a.m., at 14,027 feet. Gas clear; netting plainly visible through the balloon.

September 1.

Before starting the gas was thick and opaque.
At 4^h 55^m p.m., at 2214 feet. Gas still opaque.
At 5^h 1^m 30^s p.m., at 3170 feet. Gas very opaque.
At 5^h 15^m p.m., at 3680 feet. Gas very opaque, issuing from the neck very fast, like smoke.
At 5^h 26^m p.m., at 3837 feet. Gas very opaque.
At 5^h 30^m p.m., at 4000 feet. Gas opaque, issuing from the neck like smoke.

September 5.

Before starting the gas was very opaque. During this ascent no observations of the state of the gas were made.

September 8.

Before starting the gas was opaque.
At 4^h 49^m p.m., at 1232 feet. Gas was clear.
At 4^h 51^m p.m., at 2432 feet. Gas getting opaque; netting scarcely visible through the balloon.
At 4^h 52^m 30^s p.m., at 2923 feet. Gas opaque.
At 5^h 15^m 35^s p.m., at 5026 feet. Gas partially clear.
At 5^h 23^m 50^s p.m., at 5029 feet. Gas opaque, issuing from the neck of the balloon.
At 5^h 28^m p.m., at 4829 feet. Gas very clear.
At 5^h 52^m 14^s p.m., at 600 feet. Gas clear.

General Remarks.

These eight ascents have led me to conclude, firstly, that it was necessary to employ a balloon containing nearly 90,000 cubic feet of gas; and that it was impossible to get so high as six miles, even with a balloon of this magnitude, unless carburetted hydrogen, varying in specific gravity from 370 to 330, had been supplied for the purpose.

It is true that these statements are rather conflicting when compared with the statements made by one or two early travellers, who professed to have reached some miles in height with small balloons. But if we recollect that at $3\frac{3}{4}$ miles high a volume of gas will double its bulk, we have at once a ready means of determining how high a balloon can go; and in order to reach an elevation of six or seven miles it is obvious that one-third of the capacity of the balloon should be able to support the entire weight of the balloon, inclusive of sufficient ballast for the descent.

The amount of ballast taken up affords another clue as to the power of reaching great heights. Gay-Lussac's ballast, as before mentioned, was reduced to 33 lbs. Rush and Green, when their barometers, as stated by them, stood at 11 inches, had only 70 lbs. left, and this was considered a sufficient playing-power. We found that it was desirable to reserve five or six hundred pounds; and although we could have gone higher by saving less, still on every occasion it was evident that a large amount of ballast was indispensable to regulate the descent and select a favourable spot for landing.

Secondly, it was manifest throughout our various journeys that excessive altitude and extended range as to distance are quite incompatible. The reading of the instruments establishes this; and it has been pointed out what a short time the balloon held its highest place, and how reluctantly it appeared to linger even at a somewhat less elevation. This was not owing to any leakage or imperfection in the balloon itself, for its efficiency has been well tested, and it remained intact a whole night without the least perceptible loss of gas.

It has been stated by an aëronaut of experience that strong opposing upper currents have been heard to produce an audible contention, and to sound like the "*roaring of a hurricane.*" Now, the only deviation we experienced from the most perfect stillness was a slight whirring noise in the netting, and this only when the balloon was rising with great rapidity, and a slight flapping on descending, when the balloon is in a collapsed state.

I may also state that the too readily accepted theory as to the prevalence of a settled west or north-west wind was not confirmed in our trips. Nor was the appearance of the upper surface of the clouds such as to establish the theory that the clouds assume a counterpart of the earth's surface below, and rise or fall like hills or dales.

The formation of vapour along the course and sinuosities of the river during an ascent from the Crystal Palace has been already alluded to; this was a very remarkable demonstration.

General Conclusions.

Perhaps the most important conclusions which can be drawn from the experiments at present are:—

1. That the temperature of the air does not decrease uniformly with increase of elevation above the earth's surface, and consequently the theory of a decline of temperature of 1° in every 300 feet must

be abandoned. In some cases, with a clear sky, the decline of 1° has taken place within 100 feet of the earth, and for a like decrease of temperature it is necessary to pass through more than 1000 feet at heights exceeding 5 miles.

The determination of the decrease of temperature with elevation, and its law, is most important, and the balloon is the only means by which this element can be determined; very many more experiments are, however, necessary.

2. That the humidity of the air decreases with height in a wonderfully decreasing ratio, till at heights exceeding five miles the amount of aqueous vapour in the atmosphere is very small indeed.
3. That an aneroid barometer read correctly to the first place, and probably to the second place of decimals, to a pressure as low as 7 inches.
4. That dry- and wet-bulb thermometers can be used effectively up to any heights on the earth's surface where man can be located.
5. That the balloon affords a means of solving with advantage many delicate questions in physics; and,
6. That the observations can be made with tolerable safety to the observer; and therefore that the balloon may be used as a philosophical agent in many investigations.

List of Stations where Meteorological Observations were made on the days of the several Balloon Ascents.

Names of Stations.	Latitude.	Longitude.	Height above Sea-level.	Observer.
	° ′	° ′	feet.	
Greenwich	51 28 N.	0 0	158	The Astronomer Royal.
Wrottesley	52 37	2 13	531	Lord Wrottesley.
Wolverhampton	52 37	2 13	490	
Belvoir Castle	52 54	0 39 W.	260	W. Ingram, Esq.
Grantham	52 54	0 39	181	J. W. Jeans, Esq.
Nottingham	52 57	......	174	E. J. Lowe.
Hawarden	53 11	3 2	260	Dr. Moffat.
Liverpool	53 25	3 0	37	J. Hartnup, Esq.
Wakefield	53 40	1 30	115	W. R. Milner, Esq.

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

July 17.

Royal Observatory, Greenwich.

Time of Observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the Dew-point.	Tension of Vapour.	Degree of Humidity.	Direction of Wind.	Amount of Cloud 0–10.	Amount of Ozone.	Remarks.
h m	in.	°	°	°	in.					
9 0 a.m.	29·73	62·0	57·2	53·1	·404	73	W.	5	5	Cirrocumulus, cirrostratus, and cirrus.
9 10 „	29·73	62·0	57·0	52·7	·399	72	...	5	...	
9 20 „	29·73	62·0	57·0	52·7	·399	72	...	6	...	
9 30 „	29·73	62·0	56·4	51·6	·382	69	W.	6	...	Cirrocumulus, cirrostratus.
9 40 „	29·73	63·7	57·8	52·9	·401	68	...	6	...	
9 50 „	29·73	63·3	57·5	52·6	·397	68	...	6	...	Cirrus, cirrocumulus, cumulus, [stratus.
10 0 „	29·74	63·9	57·8	52·8	·400	67	W.	7	...	Light cloud, fine and bright.
10 10 „	29·74	63·9	57·5	52·2	·391	66	...	7	...	
10 20 „	29·74	63·4	56·8	50·0	·361	65	...	8	...	
10 30 „	29·74	64·2	58·0	54·6	·427	71	S.W.	7	...	
10 40 „	29·74	64·6	58·2	54·7	·428	71	...	6	...	
10 50 „	29·73	63·9	57·3	51·9	·386	65	...	5	...	
11 0 „	29·73	64·6	57·5	51·6	·382	63	S.W.	5	...	Cirrus, cirrocumulus, cumulo-stratus, and cirrostratus.
11 10 „	29·73	63·1	56·8	51·5	·381	66	...	6	...	
11 20 „	29·73	65·3	58·0	52·1	·389	62	...	7	...	
11 30 „	29·73	67·7	59·9	53·7	·413	61	S.W.	8	...	
11 40 „	29·73	63·7	56·8	51·1	·375	63	...	10	...	Overcast entirely.
11 50 a.m.	29·73	63·4	58·0	53·5	·410	71	...	10	...	Cirrus, cirrostratus, and cumulostratus.
Noon.	29·73	66·5	59·5	53·9	·416	64	S.W.	9	0	Cirrus, cirrocumulus, cirrostratus, and cumulostratus.
0 10 p.m.	29·73	64·6	57·7	52·0	·388	63	...	7	...	
0 20 „	29·72	66·1	59·7	54·4	·424	66	...	5	...	
0 30 „	29·72	66·7	59·5	53·7	·413	64	S.W.	5	...	
0 40 „	29·72	68·8	61·2	55·3	·437	62	...	9	...	
0 50 „	29·72	65·5	58·5	52·8	·400	64	...	7	...	
1 0 „	29·72	64·7	58·3	53·0	·403	68	S.W.	7	...	
1 10 „	29·72	65·9	59·0	53·7	·413	64	...	6	...	Light clouds; a splendid day.
1 20 „	29·72	68·2	60·5	54·5	·425	61	...	7	...	
1 30 „	29·72	66·4	59·5	53·9	·416	65	S.W.	8	...	
1 40 „	29·72	66·2	59·5	54·1	·419	65	...	7	...	
1 50 „	29·72	66·7	59·8	54·3	·422	64	...	5	...	
2 0 „	29·72	63·4	57·2	52·0	·388	67	S.W.	7	...	
2 10 „	29·73	63·2	57·3	52·3	·393	67	...	8	...	Cirrus, cirrocumulus, and cirrostratus.
2 20 „	29·73	63·4	57·3	52·2	·391	67	...	9	...	
2 30 „	29·73	63·7	58·0	53·3	·407	69	S.W.	9	...	
2 40 „	29·73	63·0	57·8	53·4	·409	71	...	10	...	Dull-looking, clouds in S.W.
2 50 „	29·73	62·3	57·2	52·8	·400	72	...	10	...	Generally overcast; rain has [just commenced falling.
3 0 „	29·72	62·4	57·8	53·9	·416	74	S.W.	10	0	Generally overcast; rain ceased.
3 10 „	29·72	63·1	57·9	53·5	·410	71	...	10	...	
3 20 „	29·72	62·8	57·6	53·2	·406	71	...	10	...	
3 30 „	29·72	62·4	57·2	52·7	·399	71	S.W.	10	...	
3 40 „	29·73	61·7	56·4	51·8	·385	72	...	10	...	
3 50 „	29·73	61·7	56·7	52·4	·394	72	...	10	...	
4 0 „	29·73	63·2	57·2	52·1	·389	67	S.W.	10	...	
4 10 „	29·73	60·5	56·0	52·1	·389	74	...	10	...	
4 20 „	29·73	60·4	57·0	54·1	·419	80	...	10	...	
4 30 „	29·73	60·1	55·1	50·7	·370	71	S.W.	10	...	
4 40 „	29·72	60·0	54·9	50·4	·366	71	...	10	...	
4 50 „	29·73	60·0	55·2	51·0	·374	72	...	10	...	
5 0 p.m.	29·72	60·1	55·3	49·1	·349	72	S.W.	10	...	

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

July 17 (*continued*).

Wrottesley Hall.

Time of Observation.	Reading of Barom. reduced to 32° F.	Thermom. Dry.	Thermom. Wet.	Temp. of the Dew-point.	Tension of Vapour.	Degree of Humidity.	Direction of Wind.	Amount of Cloud 0–10.	Amount of Ozone.	Remarks.
h m	in.	°	°	°	in.					
9 40 a.m.	29·33	58·0	52·8	48·1	·336	70	s.w.			
9 50 „	29·33	59·2	53·9	49·2	·351	70	s.s.w.	...	...	Fine.
10 0 „	29·33	60·4	55·0	50·3	·365	69	s.s.w.			
10 10 „	29·33	59·7	53·0	47·2	·325	63	s.s.w.			
10 20 „	29·33	59·0	53·1	47·9	·334	67	s.s.w.	...	...	Fine.
10 30 „	29·32	59·8	54·3	49·5	·355	71	s.s.w.			
10 40 „	29·32	59·0	53·9	49·3	·352	70	s.s.w.			
10 50 „	29·32	60·4	55·0	50·3	·365	69	s.s.w.	...	...	Fine.
11 0 „	29·32	59·0	53·2	48·1	·336	67	s.w.			
11 10 „	29·32	58·4	53·9	49·9	·360	71	s.s.w.			
11 20 „	29·32	62·7	56·9	52·0	·388	69	s.s.w.	...	...	Fine.
11 30 „	29·32	59·0	53·2	48·1	·336	67	s.s.w.			
11 40 „	29·32	62·0	56·0	50·8	·371	67	s.s.w.			
11 50 a.m.	29·32	60·0	50·0	41·2	·259	50	s.s.w.	...	...	Fine.
Noon.	29·31	62·2	55·8	50·3	·365	65	s.s.w.			
0 10 p.m.	29·31	60·1	53·9	48·4	·340	65	s.s.w.			
0 20 „	29·31	61·0	54·9	49·6	·356	66	s.w.	...	...	Dull.
0 30 p.m.	29·31	62·2	55·8	50·3	·365	65	s.	...	...	Dull.

Wolverhampton.

Time of Observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of Vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
9 20 a.m.	29·44	59·0	55·0	51·4	·379	76	s.w.	7	...	Great masses of cumulostratus [clouds.
9 52 „	29·42	59·0	54·8	51·0	·370	75	s.w.	8		
9 55 „	29·44	59·0	54·8	51·0	·370	75	s.w.	7	...	Balloon stationary.
10 0 „	......	59·5	54·8	50·8	·371	72	s.w.	9	...	Balloon invisible; passed be- [hind the clouds.
10 10 „	......	60·0	55·0	50·6	·369	71	s.w.	8	...	Great masses of cumulostratus.
10 15 „	......	59·0	55·0	51·4	·379	76	s.w.	8	...	
10 20 „	29·41	59·3	55·3	51·7	·384	76	s.w.	8	...	
10 30 „	29·41	61·0	55·8	51·3	·378	71	s.w.	7	...	
10 40 „	29·40	61·3	57·0	53·3	·407	76	s.w.	8	...	
10 55 „	......	61·5	57·0	53·1	·404	75	s.w.	6	...	
11 0 „	29·41	61·4	56·8	52·8	·400	74	s.w.	7	...	
11 10 „	......	62·2	56·9	52·3	·393	71	s.w.	6	...	
11 15 „	29·41	62·5	57·0	52·3	·393	69	s.w.	6	...	
11 25 a.m.	29·42									

Belvoir Castle.

Time of Observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of Vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
9 0 a.m.	29·54	69·5	56·3	51·8	·385	71	s.w.	...	4	Fine.
3 0 p.m.	29·53	64·0	56·5	50·3	·365	61	s.w.	...	3	Fair, but cloudy.

Nottingham.

Time of Observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of Vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
9 0 a.m.	29·70	58·6	54·3	50·4	·366	75	w.	6·5	2	Fine.
3 0 p.m.	29·66	66·9	61·2	56·6	·459	70	w.	7	...	Fine.
10 0 p.m.	29·61	52·0	49·7	47·5	·329	85	s.w.	7	...	Fine.

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

July 17 (*continued*).

Hawarden.

Time of Observation.	Reading of Barom. reduced to 32° F.	Thermom. Dry.	Thermom. Wet.	Temp. of the Dew-point.	Tension of Vapour.	Degree of Humidity.	Direction of Wind.	Amount of Cloud 0–10.	Amount of Ozone.	Remarks.
h m	in.	°	°	°	in.					
10 0 a.m.	29·51	58·5	54·0	50·0	·361	73	w.s.w.	3		
4 0 p.m.	29·47	56·5	54·0	51·7	·384	84	s.	...	4	

Liverpool.

Time of Observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of Vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
7 45 a.m.	29·81	59·8	54·8	50·4	·366	71	...	...	...	About three-fourths of the sky were covered with cloud till noon; overcast afterwards. Rain fell from 3 to 8½ p.m.
9 0 a.m.	29·81	61·2	55·0	49·7	·357	66	...	...	...	
1 0 p.m.	29·80	64·8	62·1	59·8	·514	88	...	...	...	
3 0 p.m	29·80	59·5	65·6	52·1	·389	77	...	...	...	
9 0 p.m.	29·69	56·0	53·7	51·5	·381	87	...	...	...	

Wakefield.

Time of Observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of Vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
3 0 a.m.	29·57	56·5	54·0	51·7	·384	84	s.			
9 0 a.m.	29·67	63·0	56·5	51·0	·374	65	s.w.			
3 0 p.m.	29·66	64·5	57·5	51·7	·384	63	s.w.			
9 c p.m.	29·62	56·0	54·0	52·1	·389	87	E.			

July 30.

Royal Observatory, Greenwich.

Time of Observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of Vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
4 0 p.m.	29·93	67·6	59·0	52·2	·391	58	N.E.	9	...	Cirrocumulus, cumulostratus, and cirrostratus.
4 10 „	29·93	67·5	57·0	48·6	·343	50	...	10	...	Dense cirrostratus in E.; bright cirrocumulus and cumulostratus in S.W.
4 20 „	29·93	67·4	57·4	49·4	·353	53	...	10	...	
4 30 „	29·93	67·1	57·7	50·1	·362	54	N.	10	...	A little clear sky in N.; elsewhere cirrocumulus and cumulostratus.
4 40 „	29·93	66·9	57·5	50·0	·361	56	...	10	...	Cirrocumulus, cumulostratus, cirrostratus, and a little cirrus.
4 50 „	29·93	66·5	57·4	50·1	·362	56	...	10	...	
5 0 „	29·93	66·9	57·0	49·1	·349	54	N.W.	10	...	
5 10 „	29·93	66·5	57·5	50·3	·365	56	...	...	...	
5 20 „	29·93	67·1	57·9	50·6	·369	55	...	10	...	[S. by E. Balloon last seen about $5^h 25^m$
5 30 „	29·93	66·5	57·0	49·3	·352	55	N.W.	8	...	Clear sky, principally in W. and zenith; elsewhere cirrus, cirrocumulus, and cumulostratus.
5 40 „	29·93	66·5	58·0	51·1	·375	59	..	8	...	Clear in S.S.E.; principally cirrus, cirrocumulus, and cumulostratus.
5 50 „	29·93	67·2	57·3	49·4	·353	53	...	5	...	Clear sky in W.S.W. and N.; dense cumulostratus in E. and S.E., cirrus, and cirrocumulus.
6 0 „	29·93	66·9	57·7	50·3	·365	56	N.N.W.	5	0	Half the sky covered with cirrus, cirrocumulus, cirrostratus, and cumulostratus.
7 0 „	29·93	63·6	...	...	...	...	W.N.W.			
8 0 „	29·95	60·8	...	...	...	...	W.S.W.			
9 0 „	29·96	58·9	54·0	49·6	·356	72	W.S.W.	3	0	Light cirrus, cirrocumulus, and cirrostratus.

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

August 18.

ROYAL OBSERVATORY, GREENWICH.

Time of Observation.	Reading of Barom. reduced to 32° F.	Thermom. Dry.	Thermom. Wet.	Temp. of the Dew-point.	Tension of Vapour.	Degree of Humidity.	Direction of Wind.	Amount of Cloud 0–10.	Amount of Ozone.	Remarks.
h m	in.	°	°	°	in.					
Noon	29·79	59·7	56·5	53·7	·413	82	N.W.	10	1	
0 10 p.m.	29·80	60·0	57·0	54·4	·424	82	...	10	...	
0 20 „	29·80	59·7	56·7	54·1	·419	82	...	10	...	
0 30 „	29·80	60·3	56·8	54·0	·418	79	N.W.	10	...	
0 40 „	29·81	60·9	56·8	53·3	·407	76	...	10	...	
0 50 „	29·82	60·7	56·9	53·7	·413	77	...	10	...	
1 0 „	29·81	60·4	57·5	55·0	·433	82	N.N.W.	10	...	
1 10 „	29·81	61·0	57·8	55·0	·433	81	...	10	...	
1 20 „	29·81	60·6	57·3	54·4	·424	81	...	10	...	Overcast; cirrostratus.
1 30 „	29·81	60·5	57·2	54·4	·424	81	N.W.	10	...	
1 40 „	29·81	60·5	57·5	54·9	·431	83	...	10	...	
1 50 „	29·81	60·1	56·9	54·1	·419	81	...	10	...	
2 0 „	29·81	60·4	57·1	54·3	·422	81	N.N.W.	10	...	
2 10 „	29·81	60·5	57·2	54·4	·424	81	...	10	...	
2 20 „	29·81	60·4	57·2	54·3	·422	81	...	10	...	
2 30 „	29·81	60·3	57·2	54·5	·425	82	N.W.	10	...	
2 40 „	29·81	60·3	57·3	54·7	·428	82	...	10	...	
2 50 „	29·81	60·5	57·3	54·5	·425	82	...	10	...	The clouds have just commenced to break.
3 0 „	29·80	61·5	58·3	55·6	·443	82	N.	10	1	
3 10 „	29·81	60·2	57·5	55·1	·434	84	...	10	...	
3 20 „	29·81	60·1	57·4	55·0	·433	84	...	10	...	
3 30 „	29·80	59·9	57·3	55·1	·434	85	N.	10	...	Overcast.
3 40 „	29·79	60·3	57·8	55·6	·443	85	...	10	...	
3 50 „	29·79	59·7	57·4	55·4	·439	86	...	10	...	
4 0 „	29·79	59·7	57·3	55·2	·436	86	N.	10	...	

WROTTESLEY HALL.

1 0 p.m.	29·47	61·7	57·1	53·1	·404	75	N.W.	...	...	Fine.
1 10 „	29·47	63·1	58·5	54·6	·427	74	W.N.W.			
1 20 „	29·47	63·0	57·9	53·6	·412	71	N.W.			
1 30 „	29·47	62·1	56·9	52·4	·394	71	N.W.			
1 40 „	29·47	62·9	57·1	52·2	·391	68	N.W.	...	...	Fine.
1 50 „	29·47	64·0	58·5	53·9	·416	69	W.N.W.			
2 0 „	29·47	63·6	57·6	52·6	·397	67	N.by W.			
2 10 „	29·46	64·5	58·8	52·0	·388	69	N.N.W.	...	...	Fine.
2 20 „	29·46	64·4	58·4	53·4	·409	67	W.N.W.			
2 30 „	29·46	64·6	58·5	53·4	·409	67	W.N.W.			
2 40 „	29·46	65·4	59·0	53·8	·415	67	N.W.	...	...	Fine.
2 50 „	29·45	65·9	59·8	54·8	·430	68	W.			
3 0 „	29·45	66·0	59·7	54·6	·427	67	W.N.W.			
3 10 „	29·45	66·2	59·2	53·5	·410	64	W.	...	...	Fine.
3 20 „	29·45	66·6	59·9	54·5	·425	65	W.			
3 30 „	29·44	66·8	59·9	54·1	·419	64	W.			
3 40 „	29·44	66·0	59·0	53·3	·407	64	W.			
3 50 „	29·44	66·9	60·0	54·5	·425	65	W.	...	...	Fine.
4 0 „	29·44	67·0	59·9	54·2	·421	63	W.S.W.			
4 10 „	29·44	67·0	59·4	53·3	·407	61	S.S.W.	...	...	Fine.

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

August 18 (*continued*).

BELVOIR CASTLE.

Time of Observation.	Reading of Barom. reduced to 32° F.	Thermom. Dry.	Thermom. Wet.	Temp. of the Dew-point.	Tension of Vapour.	Degree of Humidity.	Direction of Wind.	Amount of Cloud 0–10.	Amount of Ozone.	Remarks.
h m	in.	°	°	°	in.					
9 0 a.m.	29·63	56·7	53·3	50·2	·364	79	N.	...	8	Cloudy.
3 0 p.m.	29·63	68·0	59·0	51·9	·386	56	S.W.	...	0	Fair.

NOTTINGHAM.

9 0 a.m.	29·83	64·0	58·0	53·0	·403	67	N.N.E.	8	0	Dull till 8^h a.m.; the clouds then broke.
11 30 „	29·84	65·4	58·9	53·6	·412	66	N.N.E.	1	...	From this time very fine and warm.
3 0 p.m.	29·83	75·7	63·5	54·8	·430	49	N.N.W.	2	...	Very fine.
9 50 „	29·83	57·2	55·6	54·1	·419	89	W.N.W.	1	...	Very fine.

HAWARDEN.

10 0 a.m.	29·70	63·0	58·0	53·8	·415	72	N.W.	2	1	
4 0 p.m.	29·67	63·0	57·0	51·9	·386	67	N.W.	1	2	

LIVERPOOL.

7 45 a.m.	30·00	59·0	55·5	52·4	·394	79	...	...	...	
9 0 „	30·00	60·8	56·0	51·9	·386	72	...	...	...	
1 0 p.m.	30·00	63·7	58·0	53·3	·407	70	...	...	...	About half the sky was covered with cumuli and cirri till 1^h p.m.; afterwards quite clear.
3 0 „	30·00	64·4	57·8	52·3	·393	64	...	...	...	
9 0 „	29·99	59·4	56·5	53·9	·416	85	...	...	...	

WAKEFIELD.

3 0 a.m.	29·78	42·5	42·0	40·8	·255	92	E.N.E.			
9 0 „	29·85	68·0	61·0	55·5	·441	64	N.W.			
3 0 p.m.	29·80	71·5	63·0	58·3	·487	63	W.N.W.			
9 0 „	29·82	54·0	53·0	52·0	·388	93	W.			

August 20.

ROYAL OBSERVATORY, GREENWICH.

6 0 p.m.	29·82	64·3	62·3	60·6	·529	88	N.N.W.	10	0	The sky is generally covered with light cirrus, cirrostratus, and haze; a very calm evening.
6 10 „	29·82	64·2	62·1	60·3	·524	88	...	10	...	
6 20 „	29·82	64·1	61·6	59·5	·509	85	...	10	...	
6 30 „	29·82	63·7	62·0	60·6	·529	90	N.N.W.	9	...	Very hazy all round the horizon; cirrus clouds are prevalent; the Crystal Palace is scarcely discernible.
6 40 „	29·81	62·5	61·8	61·2	·541	96	...	9	...	
6 50 „	29·81	63·1	61·6	60·3	·524	91	...	9	...	Cirrus clouds prevail generally; the haze thickens; the sky is partially free from clouds in the zenith.
7 0 „	29·81	62·8	61·0	59·5	·509	89	N.N.E.	10	...	The sky appears uniformly covered with cirrus, cirrostratus, and haze.
7 10 „	29·81	62·6	60·0	57·9	·480	84	...	10	...	
7 20 „	29·81	62·5	60·2	58·3	·487	86	...	10	...	Cirrostratus and haze.
7 30 „	29·81	62·7	60·3	58·3	·487	86	N.E.	10	...	

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

August 21.

ROYAL OBSERVATORY, GREENWICH.

Time of Observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the Dew-point.	Tension of Vapour.	Degree of Humidity.	Direction of Wind.	Amount of Cloud 0–10.	Amount of Ozone.	Remarks.
h m	in.	°	°	°	in.					
August 20. Midnight	29·82	59·7	59·7	59·7	·512	100	S.S.E.	10	0	Overcast; amount of cloud variable.
August 21. 1 0 a.m.	29·82	59·6	...	...	...	...	S.E.	...	...	Generally cloudy during the night and early morning.
2 0 „	29·82	59·1	...	...	...	...	S.E.	...	...	
3 0 „	29·81	58·8	...	...	...	...	S.E.	...	...	
4 0 „	29·81	58·0	...	...	...	...	S.	...	...	
5 0 „	29·80	58·6	...	...	...	...	S.S.E.	...	...	
6 0 „	29·80	58·8	...	...	...	...	S.W.	...	...	
7 0 „	29·80	59·6	...	...	...	...	E.S.E.	...	...	
8 0 „	29·80	62·0	...	...	...	...	E.S.E.	...	...	
9 0 „	29·79	64·3	62·5	60·9	·535	89	E.S.E.	10	0	

September 1.

ROYAL OBSERVATORY, GREENWICH.

Time of Observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of Vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
4 0 p.m.	29·79	61·8	56·4	51·7	·384	70	E.	10	...	Sky is generally covered with cirrostratus.
4 10 „	29·79	61·5	56·3	51·8	·385	71	...	10	...	Overcast.
4 20 „	29·79	60·9	55·9	51·6	·383	71	...	10	...	
4 30 „	29·79	60·6	56·2	52·4	·394	74	E.N.E.	10	...	
4 40 „	29·79	60·3	56·0	52·3	·393	75	...	9	...	Sky generally covered with cirrostratus; rain falling very gently.
4 50 „	29·78	60·1	55·8	53·6	·412	80	...	9	...	Rain still falling very gently; cumulus clouds in the N.; light cirrostratus in the S.
5 0 „	29·78	60·1	55·8	53·6	·412	80	E.N.E.	10	...	Rain ceased; generally overcast.
5 10 „	29·78	60·1	56·2	52·8	·400	76	...	10	...	Cirrostratus, cirrocumulus, cumulostratus, and a little cirrus.
5 20 „	29·78	60·1	56·3	53·0	·403	77	...	10	...	Ditto; clouds clearing away.
5 30 „	29·78	59·7	55·9	52·6	·397	78	E.N.E.	9	...	Cirrus, cirrostratus, cirrocumulus, and cumulostratus.
5 40 „	29·78	59·6	56·1	53·0	·403	80	...	9	...	
5 50 „	29·78	59·4	56·0	53·0	·403	80	...	10	...	
6 0 „	29·78	59·0	55·7	52·7	·399	80	E.N.E.	10	...	
6 10 „	29·78	58·7	55·7	53·0	·403	81	...	10	...	
6 20 „	29·78	58·4	55·5	52·9	·401	82	...	9	...	Cirrocumulus, cirrostratus, and cumulostratus; clouds cover the greater part of the sky.
6 30 „	29·78	57·6	55·1	53·6	·412	84	N.E.	8	...	Light cirrus and clear sky in the S.; cirrocumulus and cirrostratus in the N.
6 40 „	29·78	57·2	55·0	53·0	·403	86	...	8	...	Cirrus, cirrostratus, and cumulostratus in E.
6 50 „	29·78	57·0	54·8	52·8	·400	85	...	8	...	Cirrus, cirrostratus, and cumulostratus in W. and N.W.
7 0 „	29·78	56·3	54·7	53·2	·406	89	N.E.	8	...	Clear sky and light clouds in zenith; dense cirrostratus round the horizon.

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

September 5.

ROYAL OBSERVATORY, GREENWICH.

Time of Observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the Dew-point.	Tension of Vapour.	Degree of Humidity.	Direction of Wind.	Amount of Cloud 0–10.	Amount of Ozone.	Remarks.
h m	in.	°	°	°	in.					
Noon.	29·68	63·1	56·9	51·7	·384	66	N.E.	7	0	Cirrus, cirrostratus, cirrocumulus.
0 10 p.m.	29·68	64·3	57·6	52·0	·388	64	...	7	...	
0 20 „	29·68	65·2	58·5	53·0	·403	64	...	7	...	
0 30 „	29·68	65·8	58·6	52·7	·399	63	N.E.	7	...	
0 40 „	29·68	67·0	59·7	53·9	·416	62	...	8	...	Cirrus, cirrostratus, cumulostratus, and cirrocumulus.
0 50 „	29·69	65·8	58·7	53·9	·416	63	...	9	...	
1 0 „	29·69	64·5	57·8	52·2	·391	64	E.N.E.	10	...	
1 10 „	29·69	63·9	57·8	52·8	·400	67	...	10	...	Ditto; blue sky in N.W.
1 20 „	29·69	63·5	58·0	53·4	·409	70	...	9	...	Cirrus, cirrostratus, cirrocumulus and cumulostratus.
1 30 „	29·69	64·7	58·0	52·5	·396	65	S.W.	9	...	
1 40 „	29·70	65·9	58·4	52·3	·393	63	...	10	...	Cirrus and dense cirrostratus; rain has just commenced falling.
1 50 „	29·70	57·1	55·2	53·5	·410	87	...	10	...	Dense cirrostratus; rain falling heavily; strong negative electricity.
2 0 „	29·70	56·4	55·8	55·3	·437	96	S.E.	10	...	Overcast; cirrostratus; rain still falling.
2 10 „	29·70	56·3	55·7	55·2	·436	96	...	10	...	
2 20 „	29·70	56·6	55·9	55·4	·439	96	...	10	...	
2 30 „	29·70	57·2	56·5	55·8	·446	95	S.S.W.	10	...	
2 40 „	29·70	57·9	57·9	57·9	·480	100	...	10	...	Rain has ceased.
2 50 „	29·70	57·9	57·9	57·9	·480	100	...	10	...	Overcast; cirrostratus.
3 0 „	29·70	57·7	56·9	56·2	·453	95	S.S.W.	10	0	
3 10 „	29·70	58·0	56·8	55·7	·444	91	...	10	...	
3 20 „	29·70	57·7	56·6	56·6	·459	93	...	10	...	
3 30 „	29·70	57·9	56·8	56·8	·462	93	S.S.W.	10	...	
3 40 „	29·70	58·3	56·8	55·5	·441	90	...	10	...	
3 50 „	29·70	58·4	56·8	55·4	·439	89	...	10	...	
4 0 „	29·70	58·7	57·0	56·7	·461	89	S.S.W.	10	...	
4 10 „	29·70	58·4	56·8	55·3	·437	90	...	10	...	Overcast; cirrostratus and stratus.
4 20 „	29·70	58·5	56·9	55·4	·439	89	...	10	...	
4 30 „	29·70	58·2	57·0	55·9	·447	91	S.S.W.	10	...	Overcast; cirrostratus in N.; stratus.
4 40 „	29·70	57·8	56·0	54·4	·424	89	...	10	...	Overcast; stratus and cirrostratus.
4 50 „	29·71	57·4	56·6	55·9	·447	94	...	10	...	Overcast; rain.
5 0 „	29·71	57·2	56·4	55·7	·444	95	S.W.	10	...	
5 10 „	29·71	57·1	56·2	55·4	·439	94	...	10	...	
5 20 „	29·71	56·7	56·7	56·7	·461	100	...	10	...	Overcast; thin rain.
5 30 „	29·71	56·5	55·9	55·4	·439	96	N.W.	10	...	Overcast; rain ceased.
5 40 „	29·71	56·5	55·8	55·2	·436	96	...	9	...	Clouds broken.
5 50 „	29·71	56·4	56·4	56·4	·456	100	...	9	...	
6 0 „	29·71	56·4	56·4	56·4	·456	100	N.W.	9	...	Cirrostratus; blue sky in zenith; fine.

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

September 5 (*continued*).

WROTTESLEY HALL.

Time of Observation.	Reading of Barom. reduced to 32° F.	Thermom. Dry.	Thermom. Wet.	Temp. of the Dew-point.	Tension of Vapour.	Degree of Humidity.	Direction of Wind.	Amount of Cloud 0–10.	Amount of Ozone.	Remarks.
h m	in.	°	°	°	in.					
1 0 p.m.	29·37	57·6	52·9	48·6	·343	72	N.	...	...	Dull.
1 10 „	29·37	56·9	52·6	48·6	·343	76	N.			
1 20 „	29·37	57·0	52·7	48·7	·344	73	N.			
1 30 „	29·38	56·1	52·1	48·3	·339	75	N.	...	...	Dull.
1 40 „	29·38	55·5	51·8	48·3	·339	77	N.			
1 50 „	29·38	55·7	52·4	49·3	·352	80	N.			
2 0 „	29·38	55·8	52·7	49·1	·349	81	N.	...	...	Dull.
2 10 „	29·38	56·1	52·6	49·3	·352	77	N.			
2 20 „	29·38	56·8	53·2	49·9	·360	84	N.N.E			
2 30 „	29 39	57·0	53·2	49·7	·357	76	N.N.E.	...	...	Dull.
2 40 „	29·39	57·1	53·1	49·3	·352	75	N.N.E.			
2 50 „	29·39	57·1	53·4	50·0	·361	77	N.N.E.			
3 0 „	29·39	57·0	53·1	49·3	·352	75	N.N.E.	...	...	Dull.
3 10 „	29·39	57·2	53·4	49·9	·360	76	N.N.E.			
3 20 „	29·39	57·9	53·8	50·1	·362	75	N.N.E.			
3 30 „	29·39	58·1	54·0	50·3	·365	76	N.N.E.	...	...	Fine.
3 40 „	29·39	58·0	53·3	49·1	·349	72	N.E.			
3 50 „	29·39	58·0	53·9	50·2	·364	75	N.			
4 0 „	29·39	58·3	53·8	49·8	·358	74	N.	...	...	Fine.
4 10 „	29·39	58·2	53·9	49·1	·349	75	N.N.E.			
4 20 „	29·39	58·0	54·0	50·4	·366	76	N.N.W.			
4 30 „	29·39	58·0	54·2	50·7	·370	77	N.N.W.	...	...	Dull.
4 40 „	29·39	57·8	54·0	50·6	·369	77	N.N.W.			
4 50 „	29·40	57·6	53·8	50·3	·365	77	N.N.W.			

HAWARDEN.

10 0 a.m.	29·58	58·0	55·0	52·3	·393	81	E.	4	0	
4 0 p.m.	29·62	59·0	55·5	53·3	·407	84	N.E.	4	0	

LIVERPOOL.

7 45 a.m.	29·96	53·1	51·2	49·3	·352	87	...	...	...	The sky was nearly free from cloud in the early morning. From 9h to 1h overcast: afternoon fine.
9 0 „	29·89	56·0	52·7	49·6	·356	79	...	...	...	
1 0 p.m.	29·93	60·8	53·9	47·9	·334	72	...	...	...	
3 0 „	29·93	60·3	55·8	52·5	·396	76	...	...	...	
9 0 „	29·98	56·7	54·1	51·7	·384	90	...	...	...	

September 8.

ROYAL OBSERVATORY, GREENWICH.

4 0 p.m.	29·92	67·0	63·2	60·2	·522	79	S.W.	10	...	Generally overcast.
4 10 „	29·92	66·8	63·2	60·3	·524	80	...	10	...	
4 20 „	29·92	67·1	63·3	60·3	·524	79	...	10	...	
4 30 „	29·92	67·4	63·5	60 4	·526	79	S.W.	10	...	Overcast; cirrostratus.
4 40 „	29·92	67·5	63·6	60·5	·528	78	...	10	...	Generally overcast; cirrostratus.
4 50 „	29·92	66·9	63·4	60·6	·527	83	...	10	...	Balloon seen from top of Octagon Room; overcast.

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

September 8 (*continued*).

ROYAL OBSERVATORY, GREENWICH.

Time of Observation.	Reading of Barom. reduced to 32° F.	Thermom. Dry.	Thermom. Wet.	Temp. of the Dew-point.	Tension of Vapour.	Degree of Humidity.	Direction of Wind.	Amount of Cloud 0–10.	Amount of Ozone.	Remarks.
h m	in.	°	°	°	in.					
5 0 p.m.	29·92	66·4	63·2	60·6	·529	83	S.W.	10	...	Overcast. Balloon disappeared behind clouds at 4h 55m. Saw the balloon due S., moving towards Eltham.
5 10 „	29·92	66·7	63·0	60·1	·520	80	...	9	...	Balloon seen for the last time. Overcast; cirrostratus.
5 20 „	29·92	65·7	63·0	60·9	·631	84	...	9	...	Clouds broken in S. and W.; cirrocumulus.
5 30 „	29·92	65·6	63·0	61·0	·537	85	S.W.	8	...	Cirrocumulus.
5 40 „	29·92	65·2	62·8	60·7	·531	85	...	8	...	
5 50 „	29·92	64·8	62·4	60·4	·526	86	...	6	...	
6 0 „	29·92	64·7	62·2	60·2	·522	86	S.W.	6	...	
6 10 „	29·92	64·2	62·0	60·2	·522	87	...	5	...	
6 20 „	29·93	64·0	62·0	60·3	·524	88	...	8	...	Cirrocumulus; sun shining on dome of Great Equatorial.
6 30 „	29·93	63·7	62·0	60·6	·529	90	S.W.	10	...	Overcast.
6 40 „	29·93	63·4	61·9	60·7	·531	91	...	10	...	Overcast; cirrocumulus, cumulus, and cirrostratus.
6 50 „	29·93	63·3	61·7	60·4	·526	90	...	10	...	
7 0 „	29·93	62·7	61·5	60·5	·528	94	S.S.W.	10	...	Overcast.

[*From the* REPORT *of the* BRITISH ASSOCIATION *for the* ADVANCEMENT *of* SCIENCE *for* 1863.]

C

Reginald Read Esq M.D.,

from the Author.

AN ACCOUNT

OF

METEOROLOGICAL AND PHYSICAL OBSERVATIONS

MADE IN

FIVE BALLOON ASCENTS IN THE YEAR 1863

(IN CONTINUATION OF EIGHT MADE IN THE PRECEDING YEAR).

BY

JAMES GLAISHER, F.R.S., &c.

An Account of Meteorological and Physical Observations in Five Balloon Ascents in the year 1863 (*in continuation of eight made in the preceding year*), *under the auspices of the Committee of the British Association for the Advancement of Science, by* James Glaisher, *F.R.S., at the request of the Committee, consisting of Colonel Sykes, the Astronomer Royal, Lord Wrottesley, Sir D. Brewster, Sir J. Herschel, Dr. Lloyd, Admiral FitzRoy, Dr. Lee, Dr. Robinson, Mr. Gassiot, Mr. Glaisher, Prof. Tyndall, Dr. Fairbairn, and Dr. W. A. Miller.*

The principal efforts of the Committee in this series were the extension of the experiments began last year to the spring months, and particularly during the prevalence of easterly winds.

§ 1. Objects of the Experiments: Instruments and Apparatus:

Were the same as those detailed in the preceding Report; in addition, however, Sir John Herschel's actinometer was used when possible for the purpose of determining the actinic effects of the sun at different elevations; and on two or three occasions the solar spectrum was examined by means of a spectroscope, lent for the purpose by the Astronomer Royal, being the same in-

strument used by Professor Smyth on the Peak of Teneriffe, but somewhat altered by Mr. Simms to adapt it to the limited space in the balloon.

§ 2. Observing Arrangements

Were in principle the same as those of the preceding year, the only alterations made being those necessitated by the use of new instruments.

Circumstances of the Ascents, and General Observations.

The ascents were all made by Mr. Coxwell's large balloon, as in the preceding year,—four from the Crystal Palace, Sydenham, and one from Wolverton.

Ascent from the Crystal Palace, March 31.—The day was favourable, the wind was from the East, in gentle motion, the sky was blue and almost cloudless. We left the earth at $4^h\ 16^m$ P.M., and passed upwards with a very nearly even motion to the height of 19,000 feet; continued about this level for some little time, and then gradually ascended to a height of 24,000 feet, which we attained at $5^h\ 28^m$, or in $1^h\ 12^m$ after starting. On opening the valve, though it seemed to be but momentary, we descended $1\frac{1}{4}$ mile in 4 minutes; this rapid descent was checked by parting with sand, and for half an hour we kept very nearly upon a level, between 15,000 and 16,000 feet high; after this we gradually and almost continually declined, and reached the earth at $6^h\ 26^m$, the descent having been accomplished in 58 minutes.

The temperature of the air was 50° on the ground, and the air was more nearly in a normal state than I had ever before seen it; almost every successive reading of the thermometer was less than the preceding in ascending, and greater on descending; the departures from these necessary conditions in a normal state were very small on this occasion. The temperature was just zero at its highest point, and 42° on the ground. There had, therefore, on the earth been a decline of 8° during the $2^h\ 10^m$ we were away; and if the numbers on the same level be compared, it will be seen that all those when descending are lower than those ascending, indicating that the whole mass of air was declining in temperature as that in immediate contact with the earth, though possibly to a less degree.

Almost free as this day was from disturbing causes, yet there existed both warm and cold currents of air.

The temperature of each layer of air was different according to its direction of motion, and there were several different currents met with. Within 2 miles of the earth the wind was East, between 2 and 3 miles high it was directly opposite, viz., West; about 3 miles it was N.E., higher still it changed to the opposite, viz., S.W., and about 4 miles, including the highest point, it was W.

On descending, at $6^h\ 15^m$ we fell into a S.E. current, and moved towards London.

When nearly 4 miles high we traced the smoke from a furnace chimney, moving towards the West; after a time it turned more towards the East, then changed its direction two or three times, and finally followed us on our level.

At the greatest height the sky was of the deepest Prussian blue, the streets of London could be picked out as lines, and the squares could easily be seen, having all the appearance of an engineer's plan.

The river wound like a serpent; passing the eye down it, ships looked like little boats to beyond the Medway, where they were lost; the white cliffs of Margate were plainly seen; the sea beyond Deal and Dover was visible, but not the French coast. The coast-line was seen passing down the northern side of the Thames to Harwich and up to Yarmouth, with the sea beyond.

Mr. Coxwell said he could see Ipswich. Looking South, Brighton was visible, the sea beyond, and all up to Dover; the North was obscured by clouds and mist. The West was not as clear as the East, but the sun shone on the Thames at Windsor, giving it the appearance of burnished gold.

At Putney the rippling of the water at its edges was like molten silver, and all the country within these limits was map-like, every field being distinct in the suburbs of London, gradually diminishing in size as the distance from London increased. Greenwich Park was visible, the Observatory apparently a grey speck. We touched the ground at 6^h 30^m in a field belonging to Mr. G. Brown, Gaysthorn Hall, Barking Side, Essex.

Ascent from the Crystal Palace, April 18.—The balloon was partially filled during the evening of April 17, with the view of starting early the following morning. The atmosphere was at this time thick and misty; the wind on the earth was N.E., but pilot balloons, on attaining a moderate elevation, fell into a north current; the wind was moving at an estimated velocity of 40 miles an hour, and the ascent was delayed hour after hour in hopes that the upper current would change to N.E.

At 1^h p.m., when the sky was nearly covered with clouds and there were occasional gleams of sunshine, the ascent was decided upon, although it was evident it could not be one of long duration, unless the wind should change its direction, or we crossed the Channel; Mr. Coxwell did not, however, think it prudent to attempt the latter without other and special arrangements: whilst discussing this, the rope, our only connecting-link with the earth, broke, and at 1^h 17^m we started very unceremoniously, the balloon taking a lurch: Mr. Coxwell was partly jerked over the side of the car, and I was thrown among my instruments, and unfortunately both Daniell's and Regnault's hygrometers were broken. Within 3 minutes we were more than 3000 feet high; at 4000 feet cumulus clouds were on our level, and a thick mist rested everywhere on the earth. At 1^h 26^m we were 7000 feet high, in a thick mist which almost amounted to a fog; the temperature of the air continued at 32° nearly, whilst that of the dew-point increased several degrees; on passing out of the cloud these two temperatures very suddenly separated, the latter decreasing rapidly; the sky was of a deep blue, without a cloud on its surface.

At 1^h 30^m we were 10,000 feet high; directly under us was a sea of clouds; the towers of the Crystal Palace were visible, and by them we found we were moving South. The temperature before starting was 61°; it decreased to 32° on reaching the cloud, and continued at this reading whilst in it, then suddenly fell to $23\frac{1}{4}$° on leaving the cloud, and was either less or the same at every successive reading till we reached the height of 20,000 feet, when the lowest temperature was noticed.

On passing above 4 miles the temperature increased to $14\frac{1}{4}$°, and then declined to $12\frac{1}{4}$° at the highest point, viz. 24,000 feet, in 1 hour and 13 minutes after starting. When we were just 4 miles high, on descending, Mr. Coxwell began to reflect that possibly we might have been moving more quickly than we expected, and that it was necessary to descend till we could see the earth; he opened the valve rather freely at 2^h 34^m, and we descended a mile in 3 minutes; we descended quickly but less rapidly through the next mile, and reached the clouds at 12,000 feet from the earth at 2^h 42^m; on breaking through them at 2^h 44^m, still 10,000 feet from the earth, I was busy with my instruments, when I heard Mr. Coxwell exclaim, "What's that?" he had caught sight of Beachey Head. I looked over the car and the sea seemed to be under us. Mr. Coxwell again exclaimed, "There is not a moment to spare, we must save the land at all risks; leave the instruments." Mr. Coxwell almost hung to the valve-line, telling me to do the same, and not to mind cutting my hand. It was a bold decision, and was boldly carried out.

When a mile high the earth seemed to be quickly coming up to us, and we struck the ground at 2^h 48^m at Newhaven, very near the sea; but the balloon, by the very free use of the valve-line, was so crippled, that it did not move afterwards. Nearly all the instruments were broken, and, to my great regret, three very delicate and beautiful thermometers, specially sent to me for these observations by M. A. D'Abbadie, were broken.

Ascent from the North-Western Railway Works at Wolverton, June 26.—In this ascent the Directors of the North-Western Railway provided the gas, and gave every facility to Members of the Committee of the British Association and their friends to be present.

The gasometers at Wolverton are too small to hold gas enough to fill the balloon, it was therefore partially inflated the night before, and remained out all night without being influenced by the slightest wind; the morning of the ascent was also calm; the sky was of a deep blue, implying the presence of but little vapour; the atmosphere was bright and clear, and all circumstances were of the most promising kind. The time of ascent was fixed to take place some little time after the express train from London should arrive, or at a little after noon, and the completion of the filling was somewhat delayed, the extraordinary fineness of the morning promising its completion in a short time. Between 11 and 12 o'clock all these favourable circumstances changed; the sky became covered with clouds, some of them of a stormy character, the wind rose and blew strongly, the balloon lurched a great deal: much difficulty was experienced in passing the gas into the balloon, and sufficient could not be passed in by 1 o'clock. The wind was momentarily increasing, and it became very desirable to be away.

The greatest difficulty was experienced in fixing the instruments, which would have been broken but for Mr. Negretti, who had come from London to assist me, and who protected them even at the hazard of being hurt by the violent swaying of the balloon and the incessant striking of the car upon the ground, notwithstanding the united exertions of many men to hold it.

At the time of leaving the spring catch was jammed so tight by the pressure of the wind that it would not act, and we were let free by the simultaneous yielding of the men, and had to part instantly with ballast to avoid striking adjacent buildings.

It was 3^m after 1^h p.m. when we left the earth, with a strong W.S.W. wind. The temperature was 65°. In 4 minutes we were 4000 feet high, and entered a cloud with a temperature of 50°, experiencing a most painful feeling of cold, particularly Mr. Coxwell, who at the moment of leaving was overheated from his great exertions, and owing to his anxiety about the change in the weather had left without any extra clothing. As on all previous occasions, we expected soon to break through the clouds into a flood of strong sunlight, with a beautiful blue sky, without a cloud above us, and with seas of rocky clouds below; but, on the contrary, when we emerged all looked dark both above and below; we could see the earth, but it was dark and dull, and without colour; above us there were clouds. At 9000 feet high we were both struck with a sighing, or rather moaning of the wind, such as precedes a storm; it was the first time that either Mr. Coxwell or myself had ever heard such a sound in the air. We satisfied ourselves that it was in no way attributable to any movement of the cordage about the balloon, but that it was owing to conflicting currents of air beneath. At this time we saw the sun very faintly, and momentarily expected its brilliancy to increase; but instead of this, although we were now 2 miles high, we entered a fog, losing entirely

the sight of the sun; shortly afterwards fine rain fell upon us. We then entered a dry fog, passed out of it at 12,000 feet, saw the sun again faintly for a short time, and then entered a wetting fog.

At 15,000 feet we were still in fog, but it was not so wetting; at 16,000 feet we entered a dry fog; at 17,000 feet saw faint gleams of the sun, and heard a train. We were now about 3 miles high; at this time we were not in cloud, but clouds were below us; others on our level at a distance, and yet more above us. We looked with astonishment at each other, and said as we were rising steadily, we surely must soon pass through them. At 17,500 feet we were again enveloped in fog, which became wetting at 18,500 feet; we left this cloud below at 19,600 feet. At 20,000 feet the sun was just visible. We were now approaching 4 miles high; dense clouds were still above us; for a space of 2000 to 3000 feet we met with no fog, but on passing above 4 miles our attention was first attracted to a dark mass of cloud, and then to another on our level; both these clouds had fringed edges, they were both nimbi. Without the slightest doubt both these dark clouds were regular rain-clouds; whilst looking at them we again lost sight of everything, being enveloped in fog whilst passing upwards through 1000 feet. At 22,000 feet we again emerged, and were above clouds on passing above 23,000 feet. At 6 minutes to 2 o'clock we heard a railway-train; the temperature here was 18°. I wished still to ascend to find the limits of this vapour, but Mr. Coxwell said we are "too short of sand, I cannot go higher; we must not even stop here." I was therefore most reluctantly compelled to abandon the wish, and looked searchingly around. At this highest point, in close proximity to us, were rain-clouds; below us dense fog. I was again reminded that we must not stop. With a hasty glance everywhere, above, below, around, I saw the sky nearly covered with dark clouds of a stratus character, with cirri still higher, and small spaces of blue sky between them; the blue was not the blue of 4 or 5 miles high as I had always before seen it, but a faint blue, as seen from the earth when the air is charged with moisture.

Hastily glancing over the whole scene, there were no extensive, fine or picturesque views, as in such situations I had always before seen. The visible area was limited; the atmosphere was murky, the clouds were confused, and the aspect everywhere dull. I cannot avoid expressing the surprise I have felt at the extraordinary power which a situation like this calls forth, when a few moments only can be devoted to note down all appearances and all circumstances, and if not so rapidly gleaned they are lost for ever. Under such circumstances, every appearance of the most trivial kind is noticed; the eye seems to become keener, the brain more active, and every sense increased in power to meet the necessities of the case; and when we look back after the lapse of time, it is wonderful how distinctly at any moment scenes so witnessed can be recalled, and made to reappear mentally in all their details.

We then began our downward journey, wondering whether we should meet the same phenomena; soon we were enveloped in fog, but passed below it when at 22,000 feet, and saw the sun faintly. At 20,000 feet we were in a wetting fog and passed beneath it at 19,500 feet, experiencing great chilliness; fog was then above and below. I now wished to ascend into the fog again, to check the accuracy of my readings as to its temperature, and the reality of the chill we had felt, so we reascended. The temperature rose to its previous reading, and fell again on descending. From the same level, for a thousand feet, we passed down through a thick atmosphere, but not in cloud or fog. Looking below, all was dark and disturbed; looking upwards, not much better. At the height of 18,000 feet we were again in fog. At 3 miles high we were still in fog, and on passing just below 3 miles

rain fell pattering on the balloon. This was 1 mile higher than we experienced rain on the ascent, and it was much heavier. On passing below 14,000 feet we entered a snow-storm, and for a space of nearly 5000 feet we passed through a beautiful scene. There were no flakes in the air, the snow was entirely composed of spiculæ of ice, of cross spiculæ at angles of 60° and 90°, and an innumerable number of snow-crystals, small in size but distinct, and of well-known forms, easily recognizable as they fell and remained on the coat. This unexpected circumstance of snow on a summer afternoon was all that was needed on this occasion to complete the experience of extreme heat of summer with the cold of winter within the range of a few hours. On passing below the snow, which we did when about 10,000 feet from the earth, we entered a murky atmosphere, which continued till we reached the ground; indeed so thick, misty, and murky was the lower atmosphere, that although we passed nearly over Ely Cathedral, and not far from it, we were unable to see it. When 5000 feet high we were without sand, and became simply a falling body, checked by the dexterity of Mr. Coxwell in throwing the lower part of the balloon into the shape of a parachute.

The place of descent was in a field on the borders of the counties of Cambridge and Norfolk, 20 miles from the mouth of the Wash and 8 miles from Ely.

Ascent from the Crystal Palace, July 11.—This ascent was intended to have been one of extreme height, and the promise of success in this respect was held out until near the time of starting, as pilot balloons had passed nearly due east, and indicated that our course would have been towards Devonshire, but so doubtful is the course a balloon will take that no certainty can be felt till the balloon has actually left. However, on this occasion pilot balloons, though at first moving towards the west, soon met with a north wind and went south. Under these circumstances the attempt to ascend five miles was abandoned, and we resolved to ascertain, as far as possible, the thickness of the stratum influenced by the east wind, to profit by the knowledge and have as long a journey as we could.

At the time of leaving, $4^h\ 55^m$ P.M., the sky was nearly covered with cirrus and cirrostratus clouds, and the wind was blowing due east. In about 4 minutes, and when at the height of about 2400 feet, the balloon suddenly changed from moving towards the west to moving due south. At 8 minutes past 5 we were over Croydon, at the height of 4600 feet, in mist, but could see the Green Man Hotel, Blackheath; we then descended, passing downwards through a thick atmosphere, till at $5^h\ 32^m$ we were 2200 feet high over Epsom Downs, and again within the influence of the east wind. We then turned to ascend, and at $5^h\ 52^m$ were 3000 feet above Reigate; here we could see Shooter's Hill and the Crystal Palace, by the two towers of which we found we were again within the influence of a north wind. We then continued to ascend, with the view of ascertaining if we could pass above the north wind; at $6^h\ 16^m$, when at 5400 feet, the wind shifted to N.N.W. and the atmosphere became very thick and misty, the sun's place being just visible. At $6^h\ 28^m$ we were 6600 feet high, and the sun was wholly obscured; we descended somewhat, but did not get below the mist. At $6^h\ 40^m$ we were 6200 feet high and directly over Horsham.

We then ascended to 6600 feet again to repeat the observations I had made, and found that the temperature in the half hour had declined 2° or 3°. At this time, $6^h\ 56^m$, cirri and cirrostratus were very much higher than ourselves, and we saw the coast near Brighton.

A consultation had been held whilst at this height with the view of crossing over to France, but our progress being so slow and the circumstances not

promising success, we came down with the view of again falling into the east wind, supposing it still to be prevalent. We met the north wind again at about 5000 feet, and the east wind at exactly the same height, viz. 2400 feet, at which we lost it on ascending. We descended to within 1000 feet of the earth and were near Worthing, at about 5 miles from the coast; we then ascended to 2700 feet, found ourselves moving towards the coast, and within the influence of a north wind; evidently, therefore, if we wished to continue our journey we must keep below 2400 feet, otherwise we should be blown out to sea. When again at the height of 2400 feet we turned to move parallel to the coast, being at this time over Arundel. Sheep in the fields were evidently very frightened, and they huddled together. We now descended to 800 feet, and thus journeyed at heights varying from 800 to 1600 feet; villagers frequently shouting to us to come down, and now and then answering our questions as to the locality we were in. The cheering cry of children was frequently heard above other sounds. Geese, cackling and frightened, scuttled off to their farms. Pheasants crowed as they were going to roost; and as we approached the end of our journey packs of dogs barked in the wildest state of excitement at the balloon.

Thus journeying, all motion seemed transferred to the landscape itself, which appeared when looking one way to be rising and coming toward us, and when looking the other sinking and receding from us. It was charmingly varied with parks, mansions, white roads, and in fact all the constituents of a rural scene of extremely beautiful character. The place of descent was Goodwood Park, the seat of the Duke of Richmond.

Ascent from the Crystal Palace, July 21.—The weather on this day was bad, the sky overcast and rainy. Although in every respect a thoroughly bad day, it was well suited to investigate, if possible, some points concerning the formation of rain in the clouds themselves; to determine why a much larger amount of rain is collected in a gauge near the surface of the earth, than in one placed at an elevation in the same locality; whether during rain the air is saturated completely, or if not, to what extent; to discover the regulating causes of a rainfall sometimes occurring in large drops, at others in minute particles.

So long back as the years 1842 and 1843 I made many experiments in order to ascertain why so great a difference in volume was found to exist in the water collected at lower stations as compared with that collected at higher. The experiments which yielded the best results were those in relation to temperature. I always found that when the rain was warm, with respect to the temperature of the air at the time, no difference existed in the quantities of rain collected at different heights; but when the temperature of the rain was lower than the temperature of the air, a considerable difference always existed.

From this circumstance, it would appear probable that the difference in the quantities of rain collected at different heights is owing (at least in part) to the great condensation of the vapour in the lower atmosphere, through being in contact with the relatively cold rain.

It was also desirable to confirm, or otherwise, Mr. Green's deductions; this gentleman believing that, whenever a fall of rain happens from an overcast sky, there will invariably be found to exist another stratum of cloud at a certain elevation above the first. We left the earth at $4^h\ 52^m$ p.m., and in 10 seconds had ascended into the mist; in 20 seconds to a level with the clouds, but not through them. At the height of 1200 feet we passed out of this rain and overlooked a range of surrounding clouds, so dazzlingly white that it was with difficulty I could read the instruments furnished with ivory scales. At the height of 2800 feet we emerged from clouds and saw a stratum of darker cloud above; we then descended to 800 feet over the West India Docks, and saw rain falling heavily upon the earth. None was falling upon the balloon; that which we saw, therefore, had its origin within 800 feet of the ground; we ascended again, and this time passed upwards through fog 1400 feet in thickness. At 3300 feet we passed out of cloud, and again saw the dark stratum at a distance above; clouds obscured the earth below. On descending, at 2700 feet we entered a dry fog, but it became wetting 100 feet lower down. After passing through 600 feet the clouds became more and more wetting, and below were intensely black. At $5^h\ 28^m$ we were about 700 feet high, or about 500 feet above Epping Forest, and heard the noise of the rain pattering upon the trees. Again we ascended to 2000 feet, and then descended, passing into squalls of rain and wind at the height of 500 feet, with rain-drops increasing in size as we descended, till they were as large as a fourpenny piece, on reaching the ground being of the same size as when we left it. On descending we found rain had been falling heavily all the time we were in the air.

§ 3. Description of the Table of Observations.

All the meteorological observations taken during the ascents are contained in Table I.

Column 1 contains the times at which the observations were made. Column 2 contains observations of the siphon barometer corrected for temperature and index error. Column 3 contains the readings of the thermometer attached to the barometer. Column 4 contains the readings of an aneroid barometer. Column 5 contains the height above the level of the sea, as deduced from the barometric observations in column 2, by the formula of Baily, checked at intervals by that of Laplace, which is as follows:—

$$Z=\log\left(\frac{h}{h'}\right)\times 60159\left(1+\frac{t+t'-64}{900}\right)\left(1+0{\cdot}002837\cos 2\,L\right)\left(1+\frac{z+52251}{20886900}\right),$$

where Z is the height required, and h, h', t and t' the height of the barometer corrected for temperature, and the temperature of the air at the lower and upper stations respectively, L the latitude. The temperature of the air for the position of the balloon has been derived from the readings in column 10. Columns 6 to 9 contain the observations with the dry- and wet-bulb thermometers free, and the deduced dew-point. Column 10 contains the readings of Negretti and Zambra's gridiron thermometer. Columns 11 to 14 contain the observations with the dry- and wet-bulb thermometers aspirated, and the deduced dew-point. Columns 15 and 16 contain the direct dew-point observations with Daniell's and Regnault's hygrometers. When numbers are entered in columns 15 and 16 with "no dew" affixed to them, it is meant that the temperature of the hygrometer has been lowered to the degree stated, but that no dew has been deposited.

The Astronomer Royal at the Royal Observatory, Greenwich, had meteorological observations taken every 10 minutes on all the days of ascent, and Dr. Lee had observations made at Wolverton by his assistant, Mr. S. Horton, with instruments furnished and adjusted by Mr. Negretti, on June 26.

In calculating the height of the balloon, the observations of Greenwich have been employed for March 31, April 18, July 11, and July 21; and those of Wolverton for June 26.

The height of Greenwich above the mean sea-level=159 feet.

The height of Wolverton above the mean sea-level=300 feet.

Table I.—Meteorological Observations made in the Ninth Balloon Ascent, from the Crystal Palace, March 31, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	4 7 0 p.m.	29·75	......	29·93	......	49·8	44·2	5·6	38·3	......	......	......	......	......	38·0	
(2)	4 10 0 ,,	29·72	......	......	......	49·8	44·2	5·6	38·3	49·8						
(3)	4 11 0 ,,	29·72	......	......	420	49·8	44·2	5·6	38·3	......	......	......	......	......	......	36·2
	4 14 0 ,,	29·72	......	29·75	420	49·2	44·2	5·0	38·9							
(4)	4 16 0 ,,	29·39	......	......	780	48·0	41·8	6·2	35·0							
	4 17 0 ,,	29·10	48·0	......	1,048	47·2	40·8	6·4	33·7	47·1						
	4 18 0 ,,	28·60	48·0	......	1,515	46·0	38·1	7·9	29·2	43·0	......	......	......	......	......	30·0
	4 20 0 ,,															
	4 20 30 ,,	......	......	......	......	......	......	......	......	38·6						
	4 21 0 ,,	26·56	46·0	......	3,507	37·5	33·0	4·5	26·8							
(5)	4 21 30 ,,	26·36	......	26·38	3,698	38·5	32·0	6·5	23·3							
	4 23 0 ,,	25·31	45·0	25·35	4,771	37·0	30·0	7·0	20·1	36·6						
(6)	4 24 0 ,,	24·82	44·0	......	5,296	35·5	29·2	6·3	19·5	35·5						
	4 25 0 ,,	24·22	......	......	5,937	35·1	26·1	9·0	11·7	33·5						
(7)	4 27 0 ,,	23·52	41·5	......	6,251	33·2	26·0	7·2	11·6							
	4 27 30 ,,	23·22	41·0	......	7,035	33·0	25·1	7·9	9·3	......	......	......	......	......	[no dew. 22·0	
	4 28 0 ,,	22·92	40·5	......	7,380	32·6	24·9	7·7	8·2							
(8)	4 29 0 ,,	22·75	40·0	......	7,557	32·1	24·8	7·3	7·9							
(9)	4 32 0 ,,	21·63	......	......	8,872	28·5	(30·0)									
(10)	4 33 0 ,,	21·33	38·0	......	9,218											
	4 35 0 ,,	20·63	38·0	20·58	10,047	26·2	19·1	7·1	−16·9	28·5	......	......	......	......	......	[no dew. 20·0
(11)	4 39 0 ,,															
	4 40 0 ,,	18·73	......	......	12,536	......	......	......	......	16·1						
(12)	4 41 0 ,,	18·33	......	18·23	13,070	19·1	10·1	9·0	−55·0	......	......	......	......	......	......	[no dew. 1·0
(13)	4 42 0 ,,															
	4 43 0 ,,	17·34	......	......	14,481	15·1	6·1	9·0	−63·6	11·0						
	4 44 0 ,,	16·84	33·0	16·93	15,198	14·2	5·1	9·1	−63·5							
	4 44 30 ,,	16·49	31·0	......	15,738	12·2	4·2	8·0	−58·0	9·5						
(14)	4 45 0 ,,	......	......	......	(15,793)	12·2	4·0	8·2	−58·0	9·0						
(15)	4 46 30 ,,	15·95	29·5	......	16,669	11·1	5·2	5·9	−40·7	13·2						
	4 46 45 ,,															
(16)	4 47 0 ,,	......	......	15·63	17,060	9·0	2·0	7·0	−52·4							
(17)	4 48 0 ,,	15·45	30·0	......	17,451	9·0	3·0	6·0	−43·6	10·5						
(18)	4 49 0 ,,	15·35	28·0	15·33	17,616	8·5	3·0	5·5	−39·7	10·3						
(19)	4 49 30 ,,	14·86	26·0	......	18,475											
(20)	4 50 0 ,,	14·96	25·0	......	18,304	11·1	7·2	3·9	−23·2	11·1						
	4 51 0 ,,	15·06	22·0	15·03	18,123	11·0	7·1	3·9	−23·4	11·1						
	1.	2.	3.	4.	5.	6.	7.	8.	9	10.	11.	12.	13.	14.	15.	16.

Notes and General Remarks.

(1) Detached cumuli; blue sky; misty.
(2) Blue sky. (3) Blue sky.
(4) Passing top of tower of Crystal Palace. (5) Very misty.
(6) London beautiful; Isle of Dogs visible at an apparent distance of one mile; a few fine cumuli clouds, apparently resting on the ground.
(7) Regnault's Hygrometer is very troublesome; I cannot get dew deposited on the cup. The earth appears to be dotted with cumuli clouds; blue lines of light are crossing each other at right angles.
(8) Very beautiful deep blue sky. Spectrum is very bright; less lines both at red and violet ends; G is quite the limit, and I cannot see to B; C is doubtful.
(9) Colours of the spectrum are very bright.
(10) The sea is visible to the south of us; London is a wonderful sight; sun shining over the Thames at Windsor, which looks like burnished gold.
(11) Can see to line F in the spectrum; violet dull; cannot see a single line beyond D.
(12) Valve opened; gas very thick.
(13) Lost sight of the violet end of the spectrum; cannot see any lines at all.
(14) Spectrum very short; no lines; can see a little beyond D to E, not F.
(15) My heart beats very loud; the sun's shape in the water is well defined; Isle of Dogs visible; St. Katherine's Docks very distinct, apparently 10 miles distant; Crystal Palace apparently nearly under us.
(16) Gas issuing from the neck of the balloon. (17) Gas yellow and opaque.
(18) No lines visible in the spectrum, faint violet rays to G; my face is of a glowing purple.
(19) Letting gas off rapidly; the earth looks beautiful.
(20) Mouth of the Thames apparently nearly under us; coast visible to Dover; can see Brighton and the sea beyond; gas suddenly became clear.

Table I.—Meteorological Observations made in the Ninth Balloon Ascent, from the Crystal Palace, March 31, 1863.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	4 52 0 p.m.	15·46	23·0	......	17,400	......	......	......	......	11·2						
(2)	4 58 30 ”	15·67	......	......	17,097	12·1	9·1	3·0	−14·2							
(3)	4 59 30 ”	15·67	......	......	17,097											
	5 2 0 ”	15·36	20·0	15·23	17,636	11·0	8·0	3·0	−15·3	12·1						
(4)	5 4 0 ”	14·96	20·0	14·93	18,293	10·5	6·0	4·5	−29·0	11·0						
	5 6 0 ”	14·66	......	14·53	18,730	9·3	2·5	6·8	−50·3	7·5						
	5 6 30 ”	14·62	17·5	......	18,795	8·2	2·0	6·2	−46·0	7·5						
(5)	5 7 0 ”	......	......	......	......	7·0	2·5	4·5	−32·6	7·0						
(6)	5 8 50 ”	14·37	17·0	13·93	19,197											
(7)	5 10 0 ”	14·27	19·0	14·03	19,356	3·0	−0·5	3·5	−28·7	4·5						
(8)	5 12 0 ”	13·47	......	13·43	20,865											
	5 14 0 ”	13·87	......	13·83	20,076											
	5 15 0 ”	13·82	......	......	20,136											
(9)	5 16 0 ”	13·68	......	13·24	20,374	2·0	−0·5	2·5	−20·6	1·0						
	5 17 0 ”	......	......	13·10												
	5 20 0 ”	13·18	11·0	......	21,331	2·0	−0·1	2·1	−16·8							
(10)	5 23 0 ”	13·48	......	......	20,749											
(11)	5 24 0 ”	13·38	......	13·33	20,910	2·0	−2·0	4·0	−33·9	0·5						
(12)	5 25 0 ”	12·88	10·0	......	21,868	1·5	−2·5	4·0	−34·9							
(13)	5 26 0 ”	12·78	......	......	22,068											
	5 27 0 ”	12·38	10·0	......	22,884	1·0	−4·0	5·0	−35·4	0·0	......	......	......	......	less than −10·0	
(14)	5 31 0 ”	15·98	......	......	16,486	3·2	......	......	......	3·1						
	5 32 0 ”	16·09	......	......	16,309	4·1										
(15)	5 33 0 ”	15·78	......	......	16,809											
(16)	5 34 0 ”	16·83	......	......	15,149	7·5										
	5 35 0 ”	16·88	......	......	15,080	8·2										
(17)	5 37 0 ”	16·88	......	......	15,080											
(18)	5 38 0 ”	16·58	13·0	16·43	15,556	11·1	9·1	2·0	− 6·4							
(19)	5 41 0 ”	16·57	16·1	16·33	15,565	9·1	6·2	2·9	− 6·3	8·5						
(20)	5 42 0 ”	16·37	15·5	......	15,872	9·3	5·1	4·2	−27·5							
(21)	5 42 30 ”	16·47	15·0	......	15,714	9·1	5·2	3·9	−35·1	8·2						
(22)	5 43 0 ”	......	......	16·13	16,080	9·1	5·1	4·0	−26·0							
(23)	5 45 0 ”	......	......	16·13	16,080	9·1	5·1	4·0	−26·0							
(24)	5 46 0 ”	16·17	......	16·13	16,080	8·0	5·1	2·9	− 7·4	8·0	......	......	......	......	less than −10·0	
	5 47 0 ”	16·17	......	16·13	16,080											
(25)	5 47 40 ”	16·17	......	......	16,080	7·2	3·1	4·1	−28·7							
(26)	5 49 0 ”	16·37	......	......	15,847	7·2	3·1	4·1	−28·7							
	5 50 0 ”	......	......	......	(15,775)	7·2	3·1	4·1	−28·7							
(27)	5 50 30 ”	......	......	......	......	......	......	......	......	......	(3·5)	(−6·0)				
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Just over the Isle of Dogs; moving S.W.; changed our course; temperature increased suddenly; Royal Observatory visible; Green Man Hotel, Blackheath, distinct; horizon not visible; mass of clouds to the N.W. so distinct that the boundary line can be traced; can see the rippling of the river below Putney Bridge.

(2) We shall cross the Thames.

(3) In a S.W. current; temperature beginning to decline; face very blue; feet very cold.

(4) Over Isle of Dogs. (5) Let gas out by opening valve.

(6) Over Victoria Docks; cold intense; hands very cold.

(7) Let gas out again; no spectrum.

(8) Nearly westerly current; Lowe's ozone powder deeply coloured.

(9) I could not get dew on Regnault's Hygrometer, and I failed to get its readings below − 10. (10) No spectrum.

(11) Had to break ice for water; over Thames; breathing deeply.

(12) Hands blue; Thames looks beautiful.

(13) Mouth of Thames visible; coast clear to Yarmouth.

(14) Mr. Coxwell's pulsations 98, mine 97 per minute.

(15) Smoke from chimney up to us going N.E.

(16) The river Thames visible almost from its source to the sea; and the adjacent country quite clear.

(17) It is a curious sight to see the little spiral lines of steam from trains on Tilbury line, Romford, and Chelmsford; between Barking and Romford.

(18) Smoke up and almost level with us. (19) Dropped pencil over the car.

(20) Regnault's Hygrometer does not act. (21) In a westerly current.

(22) No spectrum. (23) Chelmsford in sight. (24) East coast clear; Ipswich in sight.

(25) Very cold (tried vibrations of magnet, but failed).

(26) Could not get magnet to vibrate.

(27) Lowered grapnel; doubtless the large mass of iron not very distant from the magnet had exercised a good deal of influence over it.

TABLE I.—Meteorological Observations made in the Ninth Balloon Ascent, from the Crystal Palace, March 31, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Dry and Wet Thermometers (aspirated). Wet.	Dry and Wet Thermometers (aspirated). Diff.	Dry and Wet Thermometers (aspirated). Dew-point.	Hygrometers. Daniell's Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	5 51 0 p.m.	......	......	......	......	......	......	......	......	......	......	......	......	......	less than −10	no dew −10
(1)	5 52 0 „	16·47	......	......	15,630	7·0	3·0	4·0	−28·1							
	5 52 30 „	16·57	......	16·13	15,489											
	5 53 0 „	16·77	......	16·33	15,227											
(2)	5 54 0 „	16·97	13·0	16·73	14,965	7·0	6·0	1·0	− 1·8							
	5 55 0 „	17·17	......	16·83	14,622	7·0										
	5 56 0 „	17·37	......	......	14,325	8·5	7·0	1·5	− 4·6	8·5	......	......	......	......	−10·0	
	5 56 30 „	17·37	15·0	17·18	14,325	9·0	7·0	2·0	− 8·5							
(3)	5 57 0 „	17·88	15·0	17·83	13,614	10·8	7·1	3·7	−21·5							
(4)	5 57 30 „															
	5 58 0 „	18·27	......	......	13,077	11·5	8·2	3·3	−17·4	12·0						
(5)	5 58 30 „	18·47	15·0	18·33	12,797	12·2	10·1	2·1	− 6·2							
	5 59 0 „	18·87	15·5	......	12,232											
(6)	6 0 0 „															
	6 1 0 „	19·28	......	......	11,674	13·5	11·1	2·4	− 7·5	11·5						
(7)	6 2 0 „	19·47	15·0	19·33	11,486	14·5	11·2	3·3	−14·4	12·0						
(8)	6 3 0 „	19·87	......	......	10,917											
(9)	6 5 0 „	20·97	......	......	9,570	18·5	13·1	5·4	−26·9	19·0						
(10)	6 8 0 „	22·38	......	22·33	7,907	21·2	17·0	4·2	−11·8	21·5	......	......	......	......	−10·0	
(11)	6 9 0 „	22·78	......	22·73	7,443	21·5										
	6 9 30 „	......	......	......	(7,050)	22·2	18·0	4·2	− 9·7							
	6 10 0 „	23·48	16·0	23·43	6,657	23·0	19·5	3·5	− 2·4							
	6 10 30 „	......	......	......	......	......	......	......	......	26·0						
	6 11 0 „	......	......	23·78	6,279	24·2	20·5	3·7	− 1·3							
	6 11 30 „	24·18	17·0	24·13	5,901	24·8	21·0	3·8	0·0	......	......	......	......	......	0·0	
	6 12 0 „	24·38	......	......	5,696	25·1	21·2	3·9	+ 9·7	27·0						
(12)	6 13 0 „	24·77	......	......	5,273	25·5	22·0	3·5	3·5							
(13)	6 14 0 „	......	......	......	(4,910)	25·9	22·0	3·9	2·2							
	6 14 30 „	25·29	19·0	25·23	4,729	26·0	22·0	4·0	1·7	27·8						
(14)	6 15 0 „	25·57	19·0	25·53	4,441	27·8	23·0	4·8	3·3	28·5						
	6 16 0 „	25·87	......	25·83	5,168			......	......							
(15)	6 17 0 „	26·48	21·0	26·43	3,528	28·2	24·4	3·8	13·9	30·0						
	6 19 0 „	26·87	......	......	3,143	28·5	26·1	2·4	16·9	30·0						
	6 20 0 „	27·07	22·0	27·03	2,950	29·5	26·2	3·3	15·1	31·0						
	6 21 0 „	27·46	......	27·38	2,570	30·0	27·2	2·8	18·4							
	6 22 0 „	27·96	24·0	......	1,908	30·0	27·5	2·5	19·7							
	6 22 30 „	28·16	......	......	1,724	30·9	27·5	3·4	18·4							
(16)	6 23 0 „	28·36	25·0	28·33	1,590	31·5	28·0	3·5	19·9							
(17)	6 24 0 „	28·86	......	......	1,260	32·2	28·5	3·7	20·0							
	6 25 0 „	29·06	24·0	......	1,070	32·8	29·0	3·8	20·4							
(18)	6 25 30 „	29·50	......	......	893	35·0										
(19)	6 30 0 „	......	......	29·89	ground	42·0										
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Darkness creeping over the earth. (2) Ground looks dark, and the sky very bright.
(3) Gas very clear. (4) *Heard some sounds from the earth.*
(5) *No spectrum; not sufficient light. All the observations to-day were made on sky spectra; I could not get a sun spectrum.*
(6) *Mr. Coxwell's hands felt as if they were scalded; he could not lower grapnel by himself.*
(7) Mr. Coxwell called me to his assistance to help him to lower the grapnel.
(8) Heard railway-train. (9) Violent retching. (10) Feeling of illness.
(11) Vomiting. (12) Over Romford. (13) Over railway-station.

(14) Fallen in with S.E. current; over Ilford Jail. At this time we fell into another current and changed our course again; *moving back.*
(15) Ozone *8.* (16) Sand out.
(17) Over Romford or Ilford. (18) Packed up in a hurry.
(19) Touched the ground at 6h 30m, at sunset, in a field belonging to Mr. G. Brown, Gaystham Hall, Barking Side, Essex, having first been caught in a tree, then broke through it; a number of rude countrymen came, and by some means the balloon was much injured.

Table I.—Meteorological Observations made in the Tenth Balloon Ascent, from the Crystal Palace, April 18, 1863.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	0 12 0 p.m.	......	......	29·80	......	61·0	55·2	5·8	50·2							
	0 15 0 „	......	......	29·80	......	59·5	53·5	6·0	48·3	59·2						
	1 13 0 „	29·66	61·0	29·83	......	60·8	54·5	6·3	49·1	60·8						
	1 14 0 „	29·66	61·0	......	......	61·5	54·2	7·3	47·8	61·5						
(2)	1 16 0 „															
(3)	1 17−0 „	29·17	60·5	......	1,030	59·2	54·0	5·2	48·4							
	1 17+0 „	28·57	60·5	28·75	1,603	57·2	51·1	6·1	45·5							
	1 18 0 „	27·97	60·0	......	2,185	56·0	50·5	5·5	45·4							
	1 18 30 „	......	......	......	(2,380)	55·2	49·0	6·2	43·1							
(4)	1 19 0 „	27·57	60·0	27·75	2,575	54·0	48·0	6·0	42·2							
(5)	1 20 0 „	......	......	26·75	3,555	49·2	43·0	6·2	36·4							
(6)	1 21 0 „															
(7)	1 21 10 „	25·79	55·0	25·75	4,392	47·2	41·0	6·2	34·1	47·0						
(8)	1 22 30 „	24·50	51·5	24·75	5,759	41·2	35·1	6·1	27·5							
	1 24 0 „	......	......	......	......	40·5	37·0	3·5	33·6							
(9)	1 24 15 „	23·90	49·0	......	6,420	39·0										
	1 24 30 „	23·61	48·5	23·90	6,744	37·0	35·2	1·8	32·7							
(10)	1 25 30 „	23·21	47·0	......	7,180	34·5	33·2	1·3	31·1							
	1 26 0 „	22·77	46·0	......	7,694	......	......	......	......	32·8						
	1 27 30 „	22·70	43·0	22·75	7,764											
(11)	....	......	......	......	......	......	......	......	......	32·2						
	1 29 0 „	......	......	20·85	10,020	32·0	25·8	6·2	12·1							
	1 29 30 „	20·63	41·0	20·60	10,342											
(12)	1 30 0 „	20·12	40·0	......	11,055	31·5	24·2	7·3	5·9	31·5						
	1 32 0 „	19·13	40·0	19·15	12,259	......	......	......	......	23·2						
(13)	1 32 30 „	......	......	......	(12,600)	23·0	31·0	......	......	23·0						
(14)	1 33 0 „	......	......	......	......	......	......	......	......	23·2						
(15)	1 34 0 „	......	......	18·35	13,340	......	......	......	......	21·0						
	1 34 10 „	......	......	17·95	14,030	......	......									
(16)	1 35 0 „	......	......	......	(14,600)	21·0	30·0	......	......	20·0						
	1 35 30 „	17·24	38·0	17·30	14,986	......	......									
(17)	1 37 0 „															
(18)	1 38 0 „															
(19)	1 39 0 „															
	1 40 0 „	16·25	30·0	16·25	16,504	17·2	13·0	4·2	−19·0	17·0						
(20)	1 42 0 „	15·86	24·0	15·85	17,057	12·0	6·0	6·0	−20·6							
(21)	1 43 0 „	15·81	24·0	15·80	17,140	12·1	5·1	7·0	−49·3							
(22)	1 47 0 „	15·46	......	15·46	17,749	12·0	5·0	7·0	−49·5							
(23)	1 48 0 „	15·81	......	14·80	18,886	12·0	4·5	7·5	−53·8							
	1.	2.	3.	4.	5.		7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Atmosphere misty and thick; wind N.E.; many clouds; now and then gleams of sunshine.

(2) Rope broke before we were ready; the spectroscope swung round; I was jerked among the instruments; Daniell's and Regnault's Hygrometers were both broken.

(3) *Rising too quickly.*

(4) *Misty.*

(5) *The line G in the spectrum is very clear; can see H and far beyond. Spectroscope directed to sky, near the sun.*

(6) The line B clear; very many lines in sky spectrum.

(7) Crystal Palace and grounds very well seen; mist resting on the earth; cumuli on level with the balloon.

(8) Misty.

(9) The coloration of photographic paper was 2 in 2 or 3 minutes.

(10) Thick mist; almost a fog.

(11) Beyond H and to A in sky spectrum, under and near the sun, lines beautifully defined; great change of focus to see A and H. Sky spectrum at some distance from the sun, less than G; can see B and several lines beyond.

(12) Above the clouds; *sea of clouds below; Crystal Palace seen clearly; wind N.*

(13) *Ozone 3 by powder; 0 by paper.*

(14) *Balloon full; no sky spectrum; dark.* (15) *Blue sky above.* (16) *Gas out.*

(17) Spectrum far beyond B, up to A when near sun. (18) Gas clear.

(19) Sky spectrum short at a little distance from sun.

(20) A stream of cold to sense. (21) Minimum thermometer 11°·2.

(22) Lurch in balloon; spectroscope swung round, and from some cause the solar radiation thermometer fell over the side of the car; I looked down, but could not see it.

(23) General tinge over countenance; heart slightly affected; largest field appeared three inches square; lowered grapnel. No spectrum; no lines; looking at sky, which was quite bright from 1h 47m to 1h 49m, with the exception of a few seconds before and after 1h 48m.

TABLE I.—Meteorological Observations made in the Tenth Balloon Ascent, from the Crystal Palace, April 18, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Dry and Wet Thermometers (aspirated). Wet.	Dry and Wet Thermometers (aspirated). Diff.	Dry and Wet Thermometers (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	1 49 0 p.m.	14·81	20·0	14·80	18,886	12·0	4·9	7·1	− 50·3							
	1 50 0 „	......	......	......	(19,140)	12·1	6·0	6·1	− 41·4	11·6						
	1 52 0 „	14·37	10·5	14·35	19,644	......	......	......	......	10·5						
(1)	1 52 50 „	......	......	14·15	20,163	11·5										
(2)	1 53 0 „															
(3)	1 54 0 „	14·15	30·0	......	24,163	12·1	6·0	6·1	− 32·6	10·5						
	1 55 0 „	14·05	......	......	20,338											
(4)	1 56 0 „	14·05	30·0	14·15	20,338											
(5)	2 0 0 „	13·75	......	......	20,943	14·0	6·0	8·0	− 56·0	12·0						
	2 2 0 „	14·05	......	14·05	20,428											
(6)	2 9 0 „	......	......	13·65	21,120	......	......	......	......	14·2						
	....	......	......	......	......	15·0	3·0	12·0	−100·0							
(7)	2 11 0 „	......	......	......	......	......	......	......	......	14·5						
(8)	2 12 0 „	13·35	......	13·35	21,646	......	......	......	......	13·0						
	2 13 0 „	......	......	13·30	21,760											
(9)	2 14 0 „	......	......	13·30	21,760	......	......	......	......	16·5						
	2 15 0 „	13·25	......	13·25	21,869	......	......	......	......	13·2						
(10)	2 15 30 „	13·20	......	......	22,041	16·0	6·2	9·8	− 69·3							
	2 22 30 „	......	......	12·75	22,954	12·5	0·0	12·5	− 97·2	12·0						
	2 27 0 „	......	......	12·60	23,258	......	......	......	......	12·3						
	2 28 0 „	......	......	......	......	......	......	......	......	12·0						
	2 28 30 „	......	......	12·50	23,460	......	......	......	......	12·0						
	2 29 0 „	12·50	......	12·50	23,460											
	2 29 30 „	......	......	12·48	23,500											
	2 30 0 „	......	......	12·50	23,460											
	2 30 30 „	12·35	......	12·35	23,753	12·5	0·5	12·0	− 92·8							
	2 31 0 „	12·45	......	12·55	23,539	......	......	......	......	12·2						
(11)	2 31 30 „															
	2 33 0 „	12·65	......	......	23,109	......	......	......	......	12·1						
	2 33 10 „	......	......	12·75	22,907	12·5	1·0	11·5	− 88·4	12·6						
(12)	2 33 30 „	......	......	13·35	21,765											
	2 33 45 „	......	......	13·55	21,381											
(13)	2 34 0 „	13·65	......	13·65	21,189	13·1	3·0	10·1	− 75·4							
(14)	....	......	......	......	......	......	......	......	......	14·5						
(15)	2 37 30 „	16·64	......	16·24	15,998	15·5	7·0	8·5	− 55·6	16·0						
	2 38 0 „	......	......	......	......	......	......	......	......	17·0						
	2 38 30 „	17·24	......	......	14,967											
	2 39 0 „	......	......	......	(14,670)	16·5	8·8	7·7	− 50·1	17·0						
	2 40 0 „	17·64	......	......	14,341											
	2 40 30 „	18·14	......	17·95	13,590	16·5	10·0	6·5	− 39·7	16·5						
	2 41 30 „	......	......	......	......	17·0	14·5	2·5	− 4·5	17·1						
	2 42 0 „	19·94	......	......	11,100	18·0	15·5	2·5	− 3·2	18·0						
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Face bluish white. (2) Examined slit of spectroscope, all seems right; dark field.
(3) Gas clear. (4) Still a dark field; far from sun.
(5) *Mr. Coxwell's pulse 113, Mr. Ingelow's 130, mine 90 per minute.*
„ 98, „ 130, „ 95 „
Mr. Glaisher's pulse very weak, Mr. Ingelow's full and strong.
(6) Opened bottles; filled four. (7) No sky spectrum; no lines.
(8) No sky spectrum; no lines. (9) Air very dry to sense.
(10) Sky spectrum B to G close to sun. From this time to $2^h\ 30^m$ I was chiefly engaged with the spectroscope; there was no spectrum at all on looking with the slit directed to the sky far from the sun; on approaching the sun the yellow first appeared, and when very near the sun the spectrum was perfect, increasing in length the nearer we approached the sun; and when a beam of light came from the sun itself, the whole spectrum was visible, the nebulous line *H* and a good way beyond at the violet end, and *A* at the red end, with innumerable lines between, *particularly at the violet end, all sharp and well-defined; on the balloon revolving the spectrum was gradually lost,* till none appeared at the sky opposite the sun. I scarcely moved my eye from the telescope during three revolutions: at the first I examined the violet end; next the red end; and then the whole spectrum.
(11) Looked at sun with red, blue, and yellow glass for anything like prominences; edge without appendages. (12) No change on paper in one minute.
(13) Mr. Coxwell uneasy; opened the valve freely, and we descended rapidly.
(14) No spectrum; cou'd not get the sun.
(15) The readings of the two barometers are discordant *I cannot say which is correct.*

TABLE I.—Meteorological Observations made in the Tenth Balloon Ascent, from the Crystal Palace, April 18, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	2 43 0 p.m.	20·04	......	......	11,003	20·0	18·1	1·9	+ 4·6	20·5						
	2 43 30 „	20·24	......	......	10,785	24·0	19·0	5·0	− 10·6	24·5						
	2 44 0 „	20·94	......	......	9,609	26·0	20·0	6·0	− 10·4	26·2						
(1)	2 48 0 „	......	......	......	ground	(57·0)										

Meteorological Observations made in the Eleventh Balloon Ascent, from Wolverton, June 26, 1863.

References to Notes.	Time.	Reading corrected	Att. Therm.	Aneroid No. 2.	Height above sea-level.	Dry.	Wet.	Diff.	Dew-point.	Gridiron Thermometer.	Dry.	Wet.	Diff.	Dew-point.	Daniell's.	Regnault's.
(2)	1 2 0 p.m.	29·70	66·0	29·80	ground	......	......	......	......	66·0						
(3)	1 3 0 „	......	......	......	......	66·0	57·0	9·0	49·8	66·0						
	1 4 0 „	29·15	66·0	......	884	65·0	56·0	9·0	48·7							
	1 4 30 „	28·57	66·0	......	1,445	62·0	54·0	8·0	47·2	62·0						
	1 6 0 „	......	......	......	......	61·8	53·5	8·3	46·4	61·5						
(4)	1 6 15 „	28·36	65·0	28·45	1,660	61·5	53·1	8·4	45·9	61·0	......	......	......	......	......	48·0
	1 6 30 „	27·86	64·0	......	2,150	59·5	51·5	8·0	44·4							
	1 7 0 „	27·36	64·0	27·55	2,651	57·2	51·2	6·0	45·7	......						
(5)	1 7 20 „	......	......	......	(3,029)	55·0	49·8	5·2	44·9	54·5	......	......	......	......	47·0	
	1 8 0 „	......	......	......	(3,785)	51·0	......	......	......	50·5						
	1 8 10 „	......	......	27·45	(3,974)	50·5	......	......	......	50·0						
	1 8 50 „	25·27	63·5	......	4,729	48·5	......	......	......	49·0						
(6)	1 9 0 „	24·87	......	......	5,264	47·0	40·0	7·0	32·2	46·0						
	1 10 0 „	24·58	60·0	......	5,578	......	......	......	......	43·0						
(7)	1 11 0 „	23·79	58·0	......	6,477											
	1 13 0 „	......	......	......	(7,300)	41·2	31·0	10·2	18·1							
	1 13 30 „	22·80	52·0	......	7,510	39·0	29·2	9·8	16·3	38·5						
	1 14 0 „	......	......	......	(7,940)	37·2	26·1	11·1	10·4	37·0						
	1 15 0 „	21·82	45·0	21·85	8,796	......	......	......	......	......	......	......	......	......	11·0	
	1 15 20 „	......	......	......	(8,827)	36·0	26·1	9·9	11·3	36·0						
(8)	1 16 0 „	......	......	21·65	8,888											
	1 16 30 „	......	......	20·75	9,298	31·2	32·0	......	......	......	......	......	......	... ..	......	8·0
(9)	1 17 0 „	......	......	20·65	9,800	......	......	......	......	31·5						
(10)	1 17 15 „	......	......	20·20	10,800											
	1 17 30 „	20·22	43·5	......	10,804											
(11)	1 17 45 „	19·93	42·0	......	11,204	30·0	31·0									
(12)	1 18 0 „	......	......	19·75	11,478											
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Suddenly the South Coast appeared under us, and Mr. Coxwell called out, "*Put up the instruments! help me! we shall be in the sea, we cannot go over!*" I began to put the instruments up instantly. He called for immediate assistance; we pulled open the valve as wide as possible, and at $2^h\ 48^m$ came to the ground with a violent crash; we were of course all thrown down; my head was struck behind, my ankle sprained, and I received a few other trifling bruises. Mr. Coxwell and Mr. Ingelow escaped unhurt; but nearly all the instruments were broken, with the exception of two large bottles of air for Prof. Tyndall; the two other bottles were broken, and unfortunately three very sensitive thermometers which had been kindly furnished me for these experiments by M. A. D'Abbadie. The descent took place about half a mile from the Newhaven Station. It was fully seven or eight minutes before any one came to our assistance. *When descending we observed two rents in the balloon, owing to the valve-line having torn it.* Mr. Coxwell tenaciously held on to the valve-line, and thus crippled the balloon, which never rose. We returned to London by the train leaving Newhaven at $7^h\ 30^m$. The blue of the sea had been mistaken for mist. Temperature on the ground 57°.

(2) Wind W.S.W.; *strong. Balloon lurched considerably; fifty men were not sufficient to keep it down*; the instruments were with difficulty mounted on the board in the car.

(3) The sky was cloudy, after a fine morning.

(4) The lower atmosphere very dark.

(5) Painfully cold. (6) Terribly cold.

(7) Dreadfully cold; put on coat with difficulty; wrapped up my neck; put on extra cap; gave Mr. Coxwell a wrapper.

(8) Faint sun; at this time the sighing, or rather moaning of the wind was heard as preceding a storm; *it is the first instance that either Mr. Coxwell or myself had heard such a sound.*

(9) Fine rain falling.

(10) Saw sun faintly.

(11) In fog, thin rain; lost sight of sun.

(12) Worked bellows for Regnault's Hygrometer.

Table I.—Meteorological Observations made in the Eleventh Balloon Ascent, from Wolverton, June 26, 1863.

References to Notes	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometer.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	1 18 20 p.m.	19·83	42·0	......	11,341	31·1	31·0	......	......	33·0						
(2)	1 19 0 ,,	19·23	41·5	19·25	12,177											
(3)	1 19 30 ,,	......	......	19·05	12,459											
(4)	1 20 0 ,,	18·83	41·5	......	12,743	30·5	30·5	......	......	32·0						
(5)	1 20 10 ,,	18·53	41·0	......	13,173	......	......	......	......	......	......	......	......	......	......	20·0
(6)	1 21 0 ,,	18·13	41·0	18·15	13,764	......	......	......	......	33·0						
(7)	1 21 10 ,,	18·03	41·0	18·00	13,913	31·0	31·0	......	......	......	......	......	......	......	20·0	
(8)	1 22 0 ,,															
(9)	1 23 0 ,,	17·63	41·0	......	14,530	32·0	29·0	......	......	......	......	......	......	......	20·0	
(10)	1 24 0 ,,	17·13	42·0	......	15,295											
(11)	1 25 0 ,,	16·93	41·0	......	15,598	30·0	29·0									
(12)	1 25 20 ,,	16·83	41·0	......	15,757	30·0	29·0									
	1 26 0 ,,	16·73	40·0	......	15,935	29·0	26·0	3·0	15·2	......	......	......	......	......	......	17·2
(13)	1 27 0 ,,	16·63	41·0	......	16,079	30·0	26·0	4·0	13·4	......	......	......	......	......	17·0	
	1 28 0 ,,	16·63	40·0	16·65	16,079	32·0	27·6	4·4	17·1	34·5	33·0	26·9	6·1	14·9		
	1 28 30 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	22·0	20·5
	1 29 0 ,,	16·53	40·0	16·55	16,274	32·0	27·0	5·0	(15·4)							
	1 29 20 ,,	......	......	......	(16,274)	33·0	28·5	4·5	16·8	......	......	......	......	......	......	21·0
(14)	1 29 30 ,,	16·53	40·0	16·55	16,274											
	1 29 45 ,,	......	......	16·40	16,486	35·0	30·0	5·0	22·0	36·2	......	......	......	......	......	24·2
(15)	1 30 0 ,,	......	......	......	(16,548)	35·9	29·8	5·2	21·5	35·6	......	......	......	......	......	23·5
	1 31 0 ,,	16·23	......	16·25	16,796											
(16)	1 31 30 ,,	......	......	16·15	16,870	34·5	29·2	5·3	17·4	......	35·0	27·0	8·0	14·2		
(17)	1 32 0 ,,	16·03	41·5	16·05	17,144											
(18)	1 32 10 ,,	16·03	......	......	17,144											
(19)	1 32 30 ,,	16·03	41·5	16·05	17,144	......	......	......	......	35·2						
(20)	1 33 0 ,,	15·93	......	......	17,242											
	1 33 30 ,,	15·88	41·5	......	17,339	......	......	......	......	34·7						
(21)	1 34 0 ,,	15·83	41·5	15·90	17,479	34·2	28·1	6·1	17·4	......	34·2	27·6	6·6	15·7		
(22)	1 34 0 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	......	19·2
	1 35 0 ,,	15·83	41·5	15·85	17,479											
	1 35 30 ,,	15·49	41·0	15·45	18,053	33·0	23·1	9·9	3·3	33·4	......	......	......	......	9·0	
(23)	1 36 0 ,,	15·33	......	15·35	18,291											
	1 36 20 ,,	15·23	41·0	15·25	18,435	29·2	21·2	8·0	− 7·8	30·5						
	1 36 30 ,,	15·23	42·0	15·15	18,435	......	......	......	......	......	......	......	......	......	......	−10·1
	1 36 45 ,,	15·13	42·0	15·15	18,555	26·2	21·0	5·2	− 5·0	26·5	......	......	......	......	......	− 9·2
(24)	1 37 0 ,,	......	......	15·15	18,560	25·0	19·0	6·0	−14·1	......	......	......	......	......	......	− 5·0
	1 38 0 ,,	......	......	......	(18,790)	25·0	18·5	6·5	−17·4	24·9	......	......	......	......	− 4·0	− 4·2
(25)	1 39 0 ,,	14·83	42·0	......	19,018	21·8										
(26)	1 39 10 ,,															
(27)	1 40 0 ,,															
(28)	1 40 0 ,,	14·73	40·5	15·75	19,178	20·6	16·2	4·4	−14·6	20·5	......	......	......	......	......	− 8·0
(29)	1 40 40 ,,	......	......	......	(19,420)	20·5	16·0	4·5	−15·5	......	20·0	16·0	4·0			
(30)	1 41 0 ,,	14·53	41·0	14·55	19,544	......	......	......	......	......	......	......	......	......	......	−11·0
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) In fog; just see the earth; misty. (2) See the sun faintly.
(3) Lowered grapnel very gradually. (4) Sun just visible; thin wet fog.
(5) Mr. Coxwell requested me to open the valve whilst he lowered the grapnel.
(6) See the sun faintly through wet fog. (7) Valve opened.
(8) Mr. Coxwell complained of pain in his hands, which were dark blue.
(9) Assisted in lowering the grapnel. (10) In fog, not wet.
(11) In dry fog. (12) Ice on Wet-bulb. (13) In fog.
(14) Faint gleams of light. (15) New Barometer nearly 16·60 inches.
(16) Train heard. (17) A period of calm, and warm to senses.
(18) Still in cloud. (19) Clouds above us still.
(20) Cloudy, and gas rushing out of the balloon in volumes. (21) Still in cloud.
(22) A sudden cloud. (23) In a wetting fog. (24) Cold, dry, thin fog.
(25) Getting clearer; faint blue sky.
(26) Just above cloud; cirri above; cloud on same level as the car all round.
(27) Clouds very high.
(28) Sun faintly shining, but cut off by the balloon.
(29) do do
(30) do do

TABLE I.—Meteorological Observations made in the Eleventh Balloon Ascent, from Wolverton, June 26, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	1 41 10 p.m.	14·53	41·0	14·55	19,544	20·0	16·0	4·0	−12·5	20·0	......	......	......	......	......	− 9·5
(2)	1 41 30 „															
(3)	1 41 45 „	14·33	41·0	......	19,909	20·5	16·0	4·5	15·5							
	1 42 0 „	14·23	41·0	......	20,167	21·1	16·0	5·1	−19·0	24·1	......	......	......	......	......	− 9·0
(4)	1 42 30 „	14·24	41·0	14·25	20,167	21·1	16·0	5·1	−19·0	21·5						
(5)	1 42 45 „															
(6)	1 43 0 „	......	......	13·95	20,648	21·0	16·0	5·0	−18·9	21·0						
(7)	1 43 30 „	......	......	......	......	19·1	16·1	3·0	− 5·9	......	19·5	15·8	3·7	......	......	−13·0
(8)	1 44 0 „	13·94	40·0	13·95	20,648	20·0	16·0	4·0	−12·5	......	......	......	......	......	......	−13·0
(9)	1 45 0 „	13·84	......	13·85	20,854											
(10)	1 46 0 „	13·64	40·0	13·65	21,266	22·0	16·1	5·9	−22·8	22·0	......	......	......	......	......	−13·0
(11)	1 47 0 „	13·59	......	......	21,357	22·0	16·0	6·0	−23·6	22·0						
(12)	1 48 0 „	13·34	......	13·35	21,978	......	......	......	......	23·0						
	1 49 0 „	13·24	......	......	22,053											
(13)	1 50 0 „	13·24	......	......	22,053	22·0	16·0	6·0	−23·6							
	1 51 0 „	......	......	13·20	22,073	21·8	16·0	5·8	−22·2							
	1 53 0 „	13·14	......	......	22,105											
	1 53 30 „	13·14	32·0	13·40	22,105	19·2	16·1	3·1	− 6·5							
	1 53 35 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	− 3·1
	1 53 40 „	......	......	......	......	......	......	......	......	......	......	......	......	......	− 3·5	
	1 53 45 „	......	......	......	......	......	......	......	......	......	......	......	......	......	− 3·5	
(14)	1 54 0 „	12·89	......	......	22,664	......	......	......	......	18·5						
(15)	1 54 30 „	......	......	......	(23,023)	18·5	16·0	2·5	− 2·5	......	......	......	......	......	......	+ 3·0
(16)	1 54 40 „	12·66	......	......	23,143	18·0	......	......	......	17·0	18·0	16·1	1·9	1·8	+ 1·5	
(17)	1 54 50 „	......	......	......	(23,200)	17·0	16·2	0·8	+10·2	......	18·0					
	1 55 0 „	13·04	......	13·05	22,965	......	......	......	......	18·0	19·0	18·0	1·0	10·7	......	+ 2·5
	1 56 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	+ 2·2	
(18)	1 57 0 „															
(19)	1 58 0 „	13·14	......	12·95	22,168	19·1	......	......	......	19·1	......	......	......	......	......	+ 2·0
	1 58 30 „	13·54	......	......	21,457	......	......	......	......	23·0	......	......	......	......	......	2·0
	1 59 0 „	13·65	33·0	13·65	21,302											
	2 0 0 „	13·85	......	13·75	20,934	26·1	21·8	4·3	0·0	26·1						
	2 1 0 „	14·25	33·0	......	20,167											
(20)	2 2 0 „	14·25	33·0	......	20,167	26·1	22·0	4·1	+ 1·2	26·1						
(21)	2 2 30 „	14·25	33·0	......	20,167	......	......	......	......	26·1						
(22)	2 2 45 „	14·25	34·0	14·27	20,167											
	2 3 0 „	14·44	35·0	14·45	19,901	26·0	24·0	2·0	13·8	26·0						
(23)	2 4 30 „	14·64	35·0	14·65	19,367	23·0	......	......	......	23·1						
(24)	2 4 45 „	......	......	......	......	23·2	23·1	0·1	22·3	......	......	......	......	......	......	15·0
	2 5 0 „	14·44	35·0	......	19,901	23·0	22·0	1·0	15·8	22·0	......	......	......	......	18·0	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Sun just visible, but cut off by the balloon.
(2) In fog again; sun invisible.
(3) Three layers of clouds we have passed; clouds still higher.
(4) Sky very pale blue between clouds.
(5) Spectrum at blue sky same as on ground.
(6) Rain-cloud to the right; two nimbus clouds near us and on the same level as ourselves.
(7) Saw the sun; the reading of the actinometer increased 8·6 div. in sun; then 3·1 div. in faint sun; then fell 2·7 div. in shade; then increased 0·8 div. in sun; and then 1·5 div. in sun in one minute.
(8) In fog.
(9) New Barometer 14·20 inches.
(10) In fog.
(11) Sun invisible.
(12) Train heard.
(13) We looked round at the very faint blue sky, covered with cirri, and estimated the height of the cloud to be many miles; atmosphere thick and misty.
(14) Cirri alone above; sky faint blue; spectrum with small instrument same as below.
(15) Could not use large spectroscope.
(16) We are above cloud, but not free from mist.
(17) No fine views or forms, all confused and dirty-looking; the sky is the same as seen from below; we have very little sand; cannot go higher.
(18) Faint blue sky above; clouds.
(19) Ozone 2.
(20) Sun very faint.
(21) Spectrum B to F; actinometer rose 5 divisions in one minute.
(22) In fog; sun invisible.
(23) In fog; very chilly.
(24) In fog.

Table I.—Meteorological Observations made in the Eleventh Balloon Ascent, from Wolverton, June 26, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	....	......	......	......	......	......	......	......	......	......	......	......	......	......	......	16·5
(2)	2 6 0 p.m.															
	2 6 10 „	......	......	......	......	23·0	21·5	1·5	12·7	23·0						
(3)	....	......	......	......	......	......	......	......	......	......						
	2 6 20 „	14·34	35·0	......	20,025	......	......	......	......	23·0	23·0	21·0	2·0			
	2 6 45 „	......	......	......	......	25·0	23·0	2·0	12·0	25·8						
	2 7 0 „	14·04	35·0	......	20,630	28·9	23·0	5·9	1·5							
(4)	2 7 30 „	14·34	34·0	14·35	20,025	28·1	23·7	4·4	5·6							
	2 8 0 „	14·64	34·0	14·65	19,367	27·5	23·6	3·9	5·4	......						
(5)	2 8 30 „	14·84	34·0	14·85	19,089	......	......	......	......	......	27·0	23·1	3·9			
	2 9 0 „	15·04	34·0	......	18,746	28·0	24·0	4·0	7·6		......	......	......	......	......	15·2
	2 9 30 „	......	......	......	......	29·2	23·1	6·1	1·1							
	2 10 0 „	15·34	34·0	15·35	18,235											
	2 10 15 „	......	......	......	......	29·0	23·5	5·5	4·6							
(6)	2 10 20 „	......	......	......	......	......	......	......	......	......						
	2 10 45 „	15·54	35·0	15·55	17,888	29·5	24·5	5·0	7·5	30·0	29·0	23·0	6·0	+1·4		
	2 11 0 „	16·04	35·0	......	17,422	29·5	24·5	5·0	7·5							
(7)	2 11 15 „	16·24	......	......	16,776	......	......	......	......	31·0						
	2 11 30 „	......	......	16·35	16,594											
	2 11 45 „	......	......	......	......	31·5	26·0	5·5	12·2	31·5						
	2 12 0 „	16·44	36·0	......	16,412	32·0	26·0	6·0	12·1							
	2 12 30 „	......	......	......	......	32·5	26·2	6·3	12·6	......						
	2 13 0 „	16·84	36·0	......	15,762	32·0	27·0	5·0	15·4	32·0	......	......	......	......	......	15·0
	2 13 15 „	......	......	16·95	15,602											
	2 13 30 „	16·99	36·0	......	15,521											
	....	......	......	......	......	......	......	......	......	......						
(8)	2 14 0 „	17·39	......	17·40	14,892	......	......	......	......	33·0	31·5	27·0	4·5	15·8		
(9)	2 14 15 „	......	......	......	......	33·0	27·0	6·0	14·9	33·5						
	2 14 30 „	17·64	36·0	......	14,501											
(10)	2 14 45 „	17·84	......	......	14,197	......	......	......	......	33·0						
(11)	2 14 50 „	18·04	36·0	......	13,896	33·0	29·2	3·8	21·6	33·0						
(12)	2 15 0 „	......	......	......	......	33·0	29·2	3·8	21·6	33·0						
(13)	2 15 5 „															
	2 15 10 „	18·74	......	......	12,865	......	......	......	......	33·0						
(14)	2 15 30 „	19·04	36·0	......	12,433	......	......	......	......	33·0						
(15)	2 15 45 „	......	......	......	......	33·0	29·5	3·5	22·5	33·0						
(16)	2 16 0 „	19·77	36·0	......	11,412											
	2 16 30 „	......	......	20·05	......	33·0	27·5	5·5	16·4							
(17)	2 17 0 „	20·44	......	20·45	10,508	33·0	27·0	6·0	14·9							
(18)	2 18 0 „	20·77	......	......	10,011	33·0	26·5	6·5	13·4							
(19)	2 19 0 „	20·77	......	......	10,011	33·5	26·0	7·5	11·8							
	2 19 30 „	20·89	......	......	9,917											
	2 19 45 „	21·29	......	......	9,402											
(20)	2 20 20 „	21·49	36·0	21·50	9,148	33·5	26·0	7·5	11·8							
(21)	2 20 30 „	22·33	37·0	22·35	8,107	34·5	27·2	7·3	14·9							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) In fog. (2) Faint gleams of light.
(3) Faint gleams of light; fog above and below, none near us.
(4) Drops of water falling from the balloon.
(5) In fog; no dew at 15°.
(6) In fog. (7) In fog. (8) In thin fog.
(9) Thin rain pattering on the balloon, and moving against us.
(10) Snow falling fast. (11) Snow-storm; dark everywhere.
(12) Spicula, cross spicula.
(13) Many six-sided figures, small but distinct, all icy particles.
(14) Dense snow, no flakes; sand out. (15) Snow appeared to rise.
(16) Sand out, golden appearance, mixing with snow. (17) No snow.
(18) Lower atmosphere very murky.
(19) Lower atmosphere has a yellowish-brown tinge, remarkably dull.
(20) Two canals in sight, straight for many miles.
(21) Lower atmosphere very murky; Mr. Coxwell had never seen it in such a state before, when far from a town.

Table I.—Meteorological Observations made in the Eleventh Balloon Ascent, from Wolverton, June 26, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	2 21 0 p.m.	......	......	24·25	(5,870)	38·0										
(1)	2 22 0 ,,	24·72	......	24·75	5,319	39·2	33·0	6·2	24·8							
(2)	2 23 0 ,,	......	......	......	......	42·0	35·1	6·9	26·6							
(3)	2 24 0 ,,	......	......	......	......	43·0	37·0	6·0	29·8	43·0	43·0	37·0	6·0	29·8		
	2 25 0 ,,	25·81	......	......	4,138											
	2 25 30 ,,	26·60	......	......	3,394	46·2	43·1	3·1	39·6							
	2 26 0 ,,	26·70	......	......	3,293	47·0	43·0	4·0	38·5							
	2 27 0 ,,	28·18	......	......	1,810											
	2 27 30 ,,	28·76	......	......	1,259											
	2 28 0 ,,	29·26	......	......	779											
(4)	2 28 + ,,	30·10	......	29·85	ground	66·5	60·0	6·5	54·7							
	Meteorological Observations made in the Twelfth Balloon Ascent, from the Crystal Palace, July 11, 1863.															
	4 44 0 p.m.	......	......	30·12	on the ground.	75·2	62·1	13·1	52·7	74·2	......	......	......	......	55·0	
	4 45 0 ,,	......	......	30·12		74·9	62·0	12·9	52·8	......	......	......	......	......	53·5	
	4 46 0 ,,	......	......	30·12		74·5	62·0	12·5	52·9	73·8						
(5)	4 47 0 ,,	......	......	30·12		74·2	61·5	12·7	52·2	......	......	......	......	......	55·0	
	4 48 0 ,,	......	......	......	......	......	......	......	......	73·3						
	4 51 0 ,,	......	......	......	......	74·1	61·0	13·1	51·4	73·2	......	......	......	......	54·0	
	4 53 0 ,,	......	......	30·11	on the ground.	74·0	61·6	12·4	52·6	73·5						
	4 54 0 ,,	......	......	......	......	73·5	60·5	13·0	50·9	73·5						
(6)	4 55 0 ,,															
	4 55 + ,,	......	......	29·80	523											
	4 56 30 ,,	......	......	29·55	748	......	......	......	......	69·2						
	4 57 0 ,,	......	......	29·35	928	70·2	57·0	13·2	46·9							
	4 58 0 ,,	......	......	29·15	1,150	......	......	......	......	66·5						
	4 58 20 ,,	......	......	28·85	1,494	65·0	57·0	8·0	50·4							
	4 58 50 ,,	......	......	28·55	1,788	......	......	......	......	64·0						
	4 59 0 ,,	......	......	28·30	2,036	62·8	51·5	11·3	41·9	62·5						
	4 59 10 ,,	......	......	28·00	2,283	62·0	52·0	10·0	43·4	61·5						
(7)	4 59 30 ,,	......	......	27·65	2,633											
	5 1 30 ,,	......	......	26·70	3,580	59·5	51·0	8·5	43·5	59·2						
	5 2 0 ,,	......	......	26·55	3,730	......	......	......	......	57·8						
	5 2 30 ,,	......	......	26·50	3,780	......	......	......	......	57·5						
	5 4 0 ,,	......	......	26·35	3,930	59·0	52·0	7·0	45·8	......	......	......	......	......	46·0	
	5 5 0 ,,	......	......	26·30	3,980	61·5	54·2	7·3	47·9	61·5						
	5 5 30 ,,	......	......	26·25	4,030	60·5	53·2	7·3	46·8	60·5						
	5 5 45 ,,	......	......	26·11	4,170	60·2	53·5	6·7	47·6	60·5	......	......	......	......	46·5	
(8)	5 6 0 ,,	......	......	26·05	4,233	59·2	54·1	5·1	49·5							
	5 7 0 ,,	......	......	26·00	4,366	59·0	54·1	4·9	49·7	......	......	......	......	......	51·5	
	5 7 30 ,,	......	......	25·78	4,610	60·0	54·8	5·2	50·3	......	......	......	......	......	48·5	
(9)	5 9 0 ,,															
	5 13 0 ,,	......	......	26·40	3,860	64·0	56·0	8·0	49·4	65·0						
	5 14 0 ,,	......	......	26·40	3,860	63·5	55·0	8·5	47·9	64·0	......	......	......	......	49·0	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Put up instruments.
(2) No sand; threw away leaden weights, &c.
(3) Cannot see any distance on land.
(4) Wind very strong; the descent was very rough and difficult. We descended in a cornfield adjoining the farm of H. Jones, Esq., on the borders of the counties of Cambridge and Norfolk.

(5) Wind East.
(6) Balloon left the earth.
(7) Balloon entered north current; changed direction.
(8) Near Croydon.
(9) Beautiful view everywhere.

Table I.—Meteorological Observations made in the Twelfth Balloon Ascent, from the Crystal Palace, July 11, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	5 14 30 p.m.	......	......	26·38	3,832											
(2)	5 15 0 "	......	......	......	......	61·5	54·2	7·3	47·9	61·5	......	......	......	......	50·2	
	5 16 0 "	......	......	26·10	4,171	62·0	55·0	7·0	49·0	62·0	......	......	......	......	49·2	
	5 17 30 "	......	......	26·10	4,171											
(3)	5 19 0 "	......	......	......	......	63·0	56·0	7·0	50·1	63·0						
	5 21 0 "	......	......	26·52	3,771	64·1	56·2	7·9	49·6	64·1						
	5 22 0 "	......	......	26·65	3,660	65·0	56·5	8·5	49·5	65·0						
	5 23 0 "	......	......	26·70	3,610	65·0	57·0	8·0	50·4	65·0						
	5 24 0 "	......	......	26·78	3,524	65·0	57·0	8·0	50·4	......	......	......	......	......	53·0	
	5 24 0 "	......	......	27·10	3,219	66·0	57·5	8·5	50·6							
	5 24 30 "	......	......	......	......	65·5	57·8	7·7	51·5							
	5 26 0 "	......	......	......	......	65·5	57·6	7·9	51·1							
	5 27 0 "	......	......	......	......	......	......	......	......	......	......	......	......	......	51·5	
(4)	5 27 30 "															
(5)	5 28 0 "	......	......	26·70	3,581	65·5	57·0	8·5	50·2	64·5						
	5 29 0 "	......	......	26·65	3,684	64·2	56·5	7·7	50·1	......	......	......	......	......	50·5	
(6)	5 29 30 "	......	......	......	......	63·8	56·5	7·3	50·4							
	5 29 45 "	......	......	26·75	3,580	64·2	56·5	7·7	50·1	......	......	......	......	......	51·5	
(7)	5 30 0 "	......	......	27·05	3,195	65·0	57·0	8·0	50·4							
(8)	5 32 0 "	......	......	27·50	2,765	65·0	57·1	7·9	50·6							
(9)	5 33 0 "	......	......	27·70	2,575	65·2	57·0	8·2	50·3							
(10)	5 34 0 "	......	......	27·85	2,470	65·2	57·6	8·2	50·3	......	......	......	......	......	50·8	
(11)	5 35 0 "	......	......	28·00	2,287	65·0	56·8	8·2	50·0							
(12)	5 36 0 "	......	......	27·95	2,332											
(13)	5 37 0 "	......	......	27·80	2,469	65·2	56·8	8·4	49·9	......	......	......	......	......	50·5	
	5 38 0 "	......	......	27·90	2,377	65·0	56·8	8·2	50·0							
(14)	5 39 0 "	......	......	27·85	2,424	......	......	......	......	65·5						
(15)	5 40 0 "	......	......	27·85	2,424	66·0	56·0	10·0	47·9	......	......	......	......	......	52·0	
(16)	5 41 0 "	......	......	27·80	2,469	66·0	55·5	10·5	47·0							
	5 42 0 "	......	......	27·80	2,470	66·0	55·5	10·5	47·0	......	......	......	......	......	50·5	
(17)	5 43 0 "	......	......	27·80	2,470											
(18)	5 43 30 "	......	......	27·78	2,488	65·5	56·0	9·5	48·3	......	......	......	......	......	50·9	
	5 44 0 "	......	......	27·79	2,488	65·3	56·0	9·3	48·4							
(19)	5 45 0 "	......	......	27·78	2,488	65·0	56·1	8·9	48·8	......	......	......	......	......	49·5	
	5 47 30 "	......	......	27·50	2,762	64·5	57·0	7·5	50·8							
	5 48 0 "	......	......	27·45	2,817	65·0	57·0	8·0	50·4	......	......	......	......	......	50·0	
(20)	5 49 0 "	......	......	27·45	2,820	65·2	57·3	7·9	50·9	......	......	......	......	......	50·0	
	5 50 0 "	......	......	27·45	2,820	65·5	57·8	7·7	51·6	......	......	......	......	......	50·5	
(21)	5 51 0 "	......	......	27·50	2,762	65·5	57·2	8·3	50·4							
	5 52 0 "	......	......	27·55	2,707	65·5	57·8	7·7	51·6	......	......	......	......	......	51·0	
(22)	5 52 30 "	......	......	27·50	2,762	65·5	57·2	8·3	50·4							
	5 53 0 "	......	......	27·35	2,926	65·0	56·2	8·8	49·0	......	......	......	......	......	50·0	
	5 53 30 "	......	......	27·20	3,046	65·0	56·2	8·8	49·0	......	......	......	......	......	50·0	
	5 54 0 "	......	......	27·10	3,157	64·2	56·5	7·7	49·9							
	5 54 30 "	......	......	27·00	3,266	64·2	56·0	8·2	49·2							
(23)	5 55 0 "	......	......	......	......	64·0	56·0	8·0	49·4							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Thin mist. (2) Atmosphere thick and misty.
(3) Cheering of people assembled at Catherham.
(4) The Times Newspaper folded four times fell over the side of the car.
(5) Sky spectrum B to G. (6) Atmosphere thick and misty.
(7) The Newspaper which fell at 5h 27½m is still visible; it looks like a bird.
(8) Sand out. (9) Paper not reached the ground.
(10) Sand out. (11) Paper has reached the ground.
(12) Over Epsom Downs. (13) About five miles from Reigate.
(14) Sand out. (15) Close to Grand Stand on Epsom Downs.
(16) Sand out. (17) Crystal Palace and Shooter's Hill visible.
(18) The two towers of the Crystal Palace not quite in a straight line with us.
(19) Sand out. (20) Near Reigate.
(21) A very fine view; crossing high road. (22) Sun seen faintly.
(23) Faint gleams of sun.

TABLE I.—Meteorological Observations made in the Twelfth Balloon Ascent, from the Crystal Palace, July 11, 1863.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer. No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	5 56 0 p.m.	......	......	26·78	3,529	63·5	56·0	7·5	49·8	......	......	......	......	......	50·0	
	5 57 0 „	......	......	26·75	3,562	63·5	56·0	7·5	49·8							
(2)	5 59 0 „	......	......	26·75	3,562	63·2	56·0	7·2	50·0							
	6 0 0 „	......	......	26·70	3,617	63·2	56·0	7·2	50·0							
	6 1 0 „	......	......	......	......	63·2	56·1	7·1	50·2	......	......	......	......	......	50·0	
	6 2 0 „	......	......	26·78	3,529	63·2	56·1	7·1	50·2							
	6 3 0 „	......	......	27·05	3,250	63·0	56·1	6·9	50·3	......	......	......	......	......	50·0	
	6 3 30 „	......	......	27·05	3,250	63·0	56·5	6·5	49·8							
(3)	6 4 0 „	......	......	27·05	3,250	63·0	56·5	6·5	49·8	......	......	......	......	......	51·0	
(4)	6 5 0 „	......	......	26·78	3,529	62·0	55·1	6·9	49·2							
(5)	6 5 30 „	......	......	26·58	3,720	61·0	54·1	6·9	48·1	......	......	......	......	......	50·3	
(6)	6 7 0 „	......	......	26·15	4,133	60·0	52·8	7·2	46·4							
	6 8 0 „	......	......	25·80	4,610	58·5	52·5	6·0	47·1							
	6 9 0 „	......	......	25·80	4,610	58·2	52·3	5·9	47·0	57·7	......	......	......	......	49·0	
	6 12 0 „	......	......	25·48	4,905	56·8	53·0	3·8	49·5	56·0	......	......	......	......	49·2	
(7)	6 13 0 „	......	......	25·30	5,105	56·8	53·0	3·8	49·5	......	......	......	......	......	50·0	
(8)	6 14 0 „	......	......	25·15	5,271	56·8	52·1	4·7	47·8	......	......	......	......	......	49·0	
	6 15 0 „	......	......	25·10	5,327	56·8	52·5	4·3	48·6	......	......	......	......	......	49·0	
(9)	6 16 0 „	......	......	25·05	5,382	57·0	54·0	3·0	51·2	......	......	......	......	......	49·5	
	6 17 0 „	......	......	24·90	5,550	56·8	51·9	4·9	47·6							
	6 17 30 „	......	......	......	......	......	......	......	......	......	......	......	......	......	49·3	
	6 18 0 „	......	......	24·78	5,684	56·2	51·5	4·7	47·2	......	......	......	......	......	48·0	
	6 19 0 „	......	......	24·75	5,718	56·2	51·5	4·7	47·2							
	6 20 0 „	......	......	24·70	5,772	56·2	51·2	5·0	46·6	......	......	......	......	......	47·1	
	6 21 0 „	......	......	24·65	5,828	56·1	51·0	5·1	46·4	......	......	......	......	......	47·0	
(10)	6 22 0 „	......	......	24·60	5,884	56·0	50·5	5·5	45·5	......	......	......	......	......	46·5	
	6 22 30 „	......	......	24·45	6,052	55·5	49·5	6·0	43·1							
	6 23 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	46·0	
	6 24 0 „	......	......	24·10	6,451	53·5	47·2	6·3	40·9	......	......	......	......	......	42·5	
	6 27 0 „	......	......	23·95	6,623	54·8	46·5	8·3	38·6	......	......	......	......	......	42·0	
	6 28 0 „	......	......	23·95	6,623	52·2	46·8	5·4	41·4							
	6 29 0 „	......	......	23·98	6,588	52·5	47·0	5·5	41·5							
(11)	6 31 0 „	......	......	24·20	6,328	53·0	47·0	6·0	41·8	53·0						
	6 32 0 „	......	......	24·32	6,186	53·0	47·1	5·9	41·2	53·0	......	......	......	......	41·5	
	6 33 0 „	......	......	24·32	6,186	53·0	47·0	6·0	41·0	53·0						
	6 34 0 „	......	......	24·32	6,186	53·0	47·0	6·0	41·0	53·0	......	......	......	......	41·5	
	6 35 0 „	......	......	24·30	6,210	53·0	47·0	6·0	41·0	53·1	......	......	......	......	40·8	
	....	......	......	24·30	6,210											
	6 38 0 „	......	......	24·50	5,976	53·0	48·2	4·8	43·4							
	6 40 0 „	......	......	24·45	6,031	53·0	47·5	5·5	42·0							
	6 46 0 „	......	......	24·40	6,087	52·5	47·0	5·5	41·5							
	6 47 0 „	......	......	24·45	6,031	52·2	47·8	4·4	43·4	......	......	......	......	......	42·0	
	6 47 30 „	......	......	......	......	52·3	47·5	4·8	42·5	......	......	......	......	......	41·8	
	6 48 0 „	......	......	24·20	6,309	51·8	47·1	4·7	43·0	......	......	......	......	......	41·5	
	6 49 0 „	......	......	24·15	6,365	51·5	47·2	4·3	42·8	51·2						
	6 50 0 „	......	......	24·10	6,420	51·1	46·8	4·3	42·4	51·0	......	......	......	......	41·5	
	6 51 0 „	......	......	24·10	6,420	51·0	46·5	4·5	41·9	51·1						
(12)	6 52 0 „	......	......	24·07	6,453	51·2	45·5	5·7	39·6	......	......	......	......	......	40·4	
	6 53 0 „	......	......	24·05	6,475	51·1	46·0	5·1	40·7	......	......	......	......	......	40·0	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Faint gleams of sun.
(2) Ozone: Moffat 1; Schönbein 0·5; Lowe 3.
(3) Sand out; misty.
(4) Chilly to sense.
(5) Misty.
(6) Ozone: Moffat 1; Schönbein 1; Lowe 3.
(7) Sand out.
(8) Very misty.
(9) Over Horsham.
(10) Cirrus and cirrostratus clouds far above.
(11) Very thick; objects below are very indistinct.
(12) The coast at Brighton is distinctly visible.

TABLE I.—Meteorological Observations made in the Twelfth Balloon Ascent, from the Crystal Palace, July 11, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	6 54 0 p.m.	......	......	......	......	51·1	46·5	4·6	41·8	51·0						
	6 54 30 „	......	......	24·00	6,530	51·1	46·0	5·1	41·7	51·0						
	6 55 0 „	......	......	23·95	6,588	51·1	46·0	5·1	41·7	......	......	......	......	......	40·5	
(1)	6 55 30 „	......	......	23·95	6,588	51·1	46·0	5·1	41·7	......	......	......	......	......	40·5	
	6 56 0 „	......	......	24·00	6,530	51·5	46·0	5·5	40·5	......	......	......	......	......	41·5	
	6 56 30 „	......	......	24·00	6,530	51·5	46·0	5·5	40·5		......	......	......	......	40·0	
	6 57 0 „	......	......	24·32	6,155	51·4	46·8	4·6	42·3	52·0						
	6 58 0 „	......	......	24·50	5,975	54·0	47·8	6·2	41·6	......						
(2)	6 59 0 „	......	......	24·90	5,523	52·2	47·1	5·1	42·0	52·5	......	......	......	......	41·0	
	7 0 0 „	......	......	25·10	5,298	52·5	48·1	4·4	43·7	52·7	......	......	......	......	41·5	
	7 1 0 „	......	......	25·05	5,355	53·2	48·3	4·9	43·4							
	7 1 30 „	......	......	25·25	5,150	53·8	49·1	4·7	44·4	......						
	7 2 0 „	......	......	25·40	4,995	54·2	50·0	4·2	45·8	54·3	......	......	......	......	48·0	
	7 2 30 „	......	......	25·55	4,840	54·0	50·0	4·0	46·1							
	7 3 0 „	......	......	25·68	4,706	54·2	50·5	3·7	47·4	......						
	7 3 30 „	......	......	25·70	4,685	54·2	51·0	3·2	47·9		......	......	......	......	47·3	
(3)	7 3 45 „	......	......	25·85	4,532	55·0	51·1	3·9	47·4							
	7 4 0 „	......	......	26·00	4,380	55·2	51·1	4·1	47·2	55·5						
	7 5 15 „	......	......	26·32	4,044						......	......	......	......	46·7	
	7 5 45 „	......	......	26·32	4,044	56·2	51·0	5·2	48·0							
	7 6 0 „	......	......	26·40	3,960	56·8	51·0	5·8	45·7							
	7 6 30 „	......	......	26·50	3,855	57·0	51·0	6·0	45·5	57·1						
	7 7 0 „	......	......	26·55	3,802	57·0	50·5	6·5	44·6	57·1	......	......	......	......	46·4	
(4)	7 7 30 „	......	......	26·70	3,645	57·2	51·0	6·2	45·3							
	7 8 0 „	......	......	27·05	3,277	58·5	50·5	8·0	42·9	58·7						
	7 9 0 „	......	......	27·20	3,120	59·5	50·0	9·5	41·6		......	......	......	......	46·0	
	7 9 30 „	......	......	27·25	3,068	59·5	50·5	9·0	42·5	......						
(5)	7 9 45 „	......	......	27·40	2,910	59·5	50·5	9·0	42·5		......	......	......	......	45·5	
	7 10 0 „	......	......	27·40	2,910	59·2	50·5	8·7	42·7							
	7 10 15 „	......	......	27·50	2,805	59·2	50·5	8·7	42·7	59·4						
	7 10 30 „	......	......	27·62	2,679	59·5	50·0	9·5	41·6							
	7 10 45 „	......	......	27·70	2,595	59·5	50·2	9·3	42·0							
	7 11 30 „	......	......	28·00	2,280	60·1	50·5	9·6	42·0							
	7 12 0 „	......	......	28·08	2,199	60·5	51·0	9·5	44·0	60·7						
(6)	7 12 30 „	......	......	28·18	2,098	61·0	51·0	10·0	42·3		......	......	......	......	44·5	
	7 13 0 „	......	......	28·27	2,007	61·2	51·0	10·2	42·1							
	7 13 30 „	......	......	28·40	1,876	61·3	51·2	10·1	42·4	......						
	7 13 45 „	......	......	......	......	61·3	51·5	9·8	42·9	61·0	......	......	......	......	44·0	
(7)	7 14 0 „	......	......	28·40	1,876	61·5	51·5	10·0	42·9							
	7 14 30 „	......	......	28·40	1,876	61·8	51·5	10·3	42·7							
	7 15 0 „	......	......	28·40	1,876	62·0	51·8	10·2	43·0	......						
	7 15 30 „	......	......	28·40	1,876	62·2	51·8	10·4	42·9		......	......	......	......	43·5	
	7 15 45 „	......	......	28·40	1,876	62·2	51·8	10·4	42·9							
	7 16 0 „	......	......	28·43	1,846	62·2	51·8	10·4	42·9	62·2						
(8)	7 16 30 „	......	......	28·50	1,776	62·4	51·8	10·6	42·7	......						
	7 17 0 „	......	......	28·55	1,727	62·8	52·1	10·7	43·0		......	......	......	......	43·0	
	7 17 30 „	......	......	28·59	1,688	62·5	52·5	10·0	44·0							
	7 18 0 „	......	......	28·68	1,601	62·8	52·8	10·0	44·3							
	7 18 30 „	......	......	28·68	1,601	63·1	52·8	10·3	44·0							
(9)	7 19 0 „	......	......	28·70	1,582	63·1	53·0	10·1	44·4	......						
	7 19 30 „	......	......	28·75	1,533	63·3	53·1	10·2	44·5		......	......	......	......	44·5	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Misty.
(2) Shoreham and Worthing.
(3) A beautiful view of the Downs.
(4) Near Newhaven.
(5) Brighton seen.
(6) Sand out.
(7) Balloon entered the east current.
(8) Sand out.
(9) Sand out.

TABLE I.—Meteorological Observations made in the Twelfth Balloon Ascent, from the Crystal Palace, July 11, 1863.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	7 20 0 p.m.	......	......	28·80	1,485	63·5	53·5	10·0	45·2	......	......	......	......	......	45·2	
	7 20 30 ,,	......	......	28·80	1,485	63·5	54·1	9·4	46·2	63·6						
	7 21 0 ,,	......	......	28·85	1,437	63·8	54·1	9·7	46·0							
	7 21 30 ,,	......	......	28·90	1,388	64·1	54·5	9·6	46·5							
(1)	7 22 0 ,,	......	......	29·00	1,290	64·3	54·5	9·8	46·4	......	......	......	......	......	45·5	
	7 23 0 ,,	......	......	29·40	904	64·5	54·5	10·0	46·2							
	7 24 0 ,,	......	......	29·40	904	65·5	55·5	10·0	47·3							
	7 24 30 ,,	......	......	29·40	904	65·5	56·0	9·5	48·2							
	7 25 0 ,,	......	......	29·40	904	65·6	56·0	9·6	48·2	65·5						
	7 25 30 ,,	......	......	29·40	904	65·8	57·0	8·8	49·8							
	7 26 0 ,,	......	......	29·30	994	66·1	56·5	9·6	48·7							
	7 26 30 ,,	......	......	29·15	1,029	66·2	56·1	10·1	48·0	......	......	......	......	......	48·5	
	7 27 0 ,,	......	......	29·08	1,092	66·2	55·7	10·5	47·3							
	7 27 15 ,,	......	......	29·05	1,119	66·5	55·5	11·0	46·6	......	......	......	......	......	48·0	
	7 27 30 ,,	......	......	29·02	1,273	66·8	55·0	11·8	45·5							
	7 27 45 ,,	......	......	28·98	1,312	66·7	54·8	11·9	45·2							
	7 28 0 ,,	......	......	28·95	1,341	66·1	54·8	11·3	45·6	66·2						
	7 28 15 ,,	......	......	28·95	1,341	66·1	54·1	12·0	44·4	......	......	......	......	......	45·0	
	7 29 0 ,,	......	......	28·95	1,341	66·5	54·5	12·0	44·8							
	7 29 30 ,,	......	......	28·95	1,341	66·2	54·5	11·7	45·1							
	7 30 0 ,,	......	......	29·05	1,231	66·2	54·5	11·7	45·1	......	......	......	......	......	44·5	
	7 30 15 ,,	......	......	29·08	1,204	66·2	54·5	11·7	45·1	66·3						
(2)	7 30 30 ,,	......	......	29·10	1,186											
	7 31 0 ,,	......	......	29·20	1,096	66·2	55·0	11·2	46·0							
(3)	7 31 30 ,,	......	......	29·20	1,096	66·8	55·5	11·3	46·4							
	7 32 0 ,,	......	......	29·20	1,096	66·8	55·0	11·8	45·5	......	......	......	......	......	45·0	
	7 32 0 ,,	......	......	29·20	1,096											
(4)	7 32 30 ,,	......	......	28·95	1,341	66·2	54·1	12·1	44·4							
	7 33 0 ,,	......	......	28·80	1,488	66·5	53·5	13·0	43·0	......	......	......	......	......	42·5	
(5)	7 34 0 ,,	......	......	28·55	1,733	66·8	53·1	13·7	42·1	67·0						
	7 34 15 ,,	......	......	28·40	1,882	66·2	52·1	14·1	40·8							
	7 34 30 ,,	......	......	28·20	2,080	66·0	52·2	13·8	40·9							
	7 34 45 ,,	......	......	28·15	2,129	65·8	52·2	13·6	40·9							
	7 35 0 ,,	......	......	27·85	2,426	65·5	52·5	13·0	41·8	......	......	......	......	......	42·0	
	7 35 30 ,,	......	......	27·72	2,555	65·1	52·5	12·6	42·1							
	7 36 0 ,,	......	......	27·72	2,555	65·2	52·5	12·7	42·2	......	......	......	......	......	42·5	
(6)	7 36 30 ,,	......	......	27·70	2,575	64·5	52·5	12·0	42·9							
	7 36 45 ,,	......	......	27·65	2,625	64·0	52·5	11·5	43·0							
(7)	7 37 0 ,,	......	......	27·65	2,625	63·8	55·0	8·8	47·6							
	7 37 30 ,,	......	......	27·59	2,687	63·5	53·1	10·4	44·4	63·4						
	7 38 0 ,,	......	......	27·62	2,657	63·2	53·1	10·1	44·6	......	......	......	......	......	43·5	
	7 38 30 ,,	......	......	27·68	2,597	63·1	53·1	10·0	44·6	......	......	......	......	......	44·0	
	7 38 45 ,,	......	......	27·70	2,577	63·1	53·7	9·4	45·7							
	7 39 0 ,,	......	......	27·70	2,577	63·0	53·8	9·2	46·0							
	7 40 0 ,,	......	......	27·78	2,497	63·0	53·8	9·2	46·0							
(8)	7 40 30 ,,	......	......	27·80	2,477	63·0	53·8	9·2	46·0	62·9						
	7 41 0 ,,	......	......	27·82	2,457	63·2	55·5	7·7	49·1							
	7 42 0 ,,	......	......	28·08	2,197	63·5	53·2	8·3	44·4							
	7 42 15 ,,	......	......	28·18	2,097	63·1	53·2	9·9	44·6							
	7 43 0 ,,	......	......	28·35	1,927	63·5	53·0	10·5	44·2							
	7 43 30 ,,	......	......	28·40	1,877	63·5	53·1	10·4	44·4							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) We are moving parallel to the coast.
(2) Sand out.
(3) Very fine view of the Downs.
(4) Nearly over Lancaster Harbour.
(5) Flocks of sheep are huddling together.
(6) Can see the Isle of Wight, and Solent.
(7) Over the Downs.
(8) Smoke moving towards the coast.

Table I.—Meteorological Observations made in the Twelfth Balloon Ascent, from the Crystal Palace, July 11, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Dry and Wet Thermometers (aspirated). Wet.	Dry and Wet Thermometers (aspirated). Diff.	Dry and Wet Thermometers (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	7 44 0 p.m.	......	......	28·45	1,827	63·7	53·0	10·7	44·1							
(1)	7 44 30 „	......	......	28·56	1,716	63·8	52·8	11·0	43·6							
	7 45 0 „	......	......	28·56	1,716	63·8	53·0	10·8	44·0							
(2)	7 46 0 „	......	......	28·70	1,580	64·2	54·1	10·1	45·8	64·2	......	......	......	......	47·0	
	7 46 30 „	......	......	28·75	1,532	64·2	54·5	9·7	46·5							
(3)	7 46 45 „	......	......	28·80	1,483	64·2	54·8	9·4	47·0							
(4)	7 47 0 „	......	......	28·80	1,483	64·2	54·8	9·4	47·0	......	......	......	......	......	47·5	
(5)	7 48 0 „	......	......	28·80	1,483	64·2	55·1	9·1	47·6							
(6)	7 48 30 „	......	......	28·80	1,483	64·2	55·5	8·7	48·4							
	7 49 0 „	......	......	28·80	1,483	64·0	56·0	8·0	49·4	......	......	......	......	......	48·0	
	7 49 30 „	......	......	28·80	1,483	64·2	56·0	8·2	49·3							
	7 50 0 „	......	......	28·95	1,337	64·5	56·1	8·4	49·2	......	......	......	......	......	48·5	
	7 50 30 „	......	......	29·00	1,289	64·5	56·0	8·5	49·0							
	7 50 45 „	......	......	29·00	1,289	64·5	56·1	8·4	49·2							
	7 51 30 „	......	......	29·05	1,241	64·5	56·1	8·4	49·2							
	7 52 0 „	......	......	29·08	1,212	64·8	56·0	8·8	48·8							
(7)	7 52 30 „	......	......	29·15	1,145	64·8	56·1	8·7	49·0	64·9	......	......	......	......	49·0	
	7 53 30 „	......	......	29·25	1,049	64·8	56·1	8·7	49·0							
	7 54 0 „	......	......	29·28	1,020	64·8	56·5	8·3	49·7							
(8)	7 54 30 „	......	......	29·30	1,000	64·9	56·7	8·2	50·0							
	7 55 0 „	......	......	29·30	1,000	65·0	56·8	8·2	50·0	......	......	......	......	......	50·0	
(9)	7 56 30 „	......	......	29·30	1,000	65·0	56·8	8·2	50·0							
	7 56 45 „	......	......	29·28	1,020	65·2	57·2	8·0	50·7	......	......	......	......	......	50·5	
	7 57 0 „	......	......	29·30	1,000	65·0	57·2	7·8	50·8							
(10)	7 57 15 „	......	......	29·27	1,029	65·2	56·8	8·2	49·9	......	......	......	......	......	50·8	
	7 58 0 „	......	......	29·30	1,000	65·2	57·1	8·1	50·5							
	7 58 30 „	......	......	29·30	1,000	65·2	57·1	8·1	50·5							
(11)	7 59 0 „	......	......	29·30	1,000	65·2	57·1	8·1	50·5							
	7 59 30 „	......	......	29·35	952	65·2	57·1	8·1	50·5							
(12)	7 59 45 „	......	......	29·50	808	65·5	57·5	8·0	50·9							
(13)	8 1 0 „	......	......	29·55	760	65·5	57·5	8·0	50·9	65·5	......	......	......	......	51·0	
(14)	8 1 30 „															
(15)	8 2 0 „	......	......	29·45	856	65·2	57·2	8·0	50·7							
(16)	8 3 0 „	......	......	29·38	923	66·1	57·0	9·1	49·6							
	8 3 30 „	......	......	29·15	1,144	65·5	56·8	8·7	49·9							
(17)	8 4 0 „	......	......	29·05	1,241	65·5	56·8	8·7	49·9							
	8 4 30 „	......	......	29·00	1,290	65·5	57·0	8·5	50·0	......	......	......	......	......	51·5	
(18)	8 5 0 „	.....	......	29·05	1,241	65·0	57·0	8·0	50·4							
(19)	8 5 15 „	......	......	29·05	1,241	65·0	57·0	8·0	50·4							
	8 6 0 „	......	......	29·10	1,192	65·1	57·1	8·0	50·5							
(20)	8 6 30 „	......	......	29·15	1,144	65·1	57·1	8·0	50·5							
	8 7 0 „	......	......	29·20	1,096	65·2	57·1	8·1	50·5							
(21)	8 7 15 „	......	......	29·25	1,048	65·2	57·1	8·1	50·5	65·3						
(22)	8 8 0 „	......	......	29·25	1,048	65·2	57·1	8·1	50·5							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Railway.
(2) Can see Arundel.
(3) A fine park; Duke of Norfolk's.
(4) Arundel Castle.
(5) Again within the influence of the East wind.
(6) Not far from Bognor.
(7) Tinkling of sheep bells; the roads are remarkably white.
(8) Very wooded country.
(9) The scene was now almost fairy-like, the panorama seemed to be moving; the wind was S.E.
(10) Cries of "come down" distinctly heard, and the cheering cries of children heard above other sounds.
(11) The wind is now E.; sea-breeze felt.
(12) Moving due West.
(13) Over Dale Park, and moving towards Portsmouth.
(14) Sand out.
(15) Very wooded country, with forests of wood.
(16) A pack of dogs barking at the balloon in the wildest state of excitement.
(17) Ducks and geese are scuttling away very much frightened.
(18) Packed up hygrometer.
(19) A very extensive wood under us.
(20) Over a very extensive wood.
(21) We are apparently about 4 or 5 miles from the coast.
(22) Heard a bugle; Chichester was stated to be 5 miles from us, by a countryman to whom we spoke.

TABLE I.—Meteorological Observations made in the Twelfth Balloon Ascent, from the Crystal Palace, July 11, 1863.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	8 9 0 p.m.	......	......	29·15	1,145	65·2	57·1	8·1	50·5							
	8 9 30 ,,	......	......	28·72	1,561	64·5	56·1	8·4	49·2							
	8 10 0 ,,	......	......	28·65	1,629	64·5	56·5	8·0	49·2							
	8 10 15 ,,	......	......	28·65	1,629	64·2	55·8	8·4	48·9							
	8 10 45 ,,	......	......	28·58	1,697	64·3	55·5	8·8	48·3							
	8 11 0 ,,	......	......	28·58	1,697	64·5	55·5	9·0	48·1							
	8 11 30 ,,	......	......	28·58	1,697											
	8 12 0 ,,	......	......	28·65	1,629	64·2	55·5	8·7	48·4							
	8 13 0 ,,	......	......	28·75	1,532	64·2	55·2	9·0	47·8							
(1)	8 14 0 ,,	......	......	28·75	1,532	64·2	56·0	8·2	49·3							
	8 14 30 ,,	......	......	28·85	1,435	64·2	56·0	8·2	49·3							
	8 15 0 ,,	......	......	29·10	1,190	63·8	56·2	7·6	49·9							
	8 15 30 ,,	......	......	29·15	1,142	63·9	56·5	7·4	50·4							
	8 16 0 ,,	......	......	29·20	1,094	64·2	56·5	7·7	50·1							
(2)	8 16 15 ,,	......	......	29·25	1,046	64·2	57·0	7·2	51·0	64·3						
	8 17 0 ,,	......	......	29·35	950	64·5	57·0	7·5	50·8							
	8 17 30 ,,	......	......	29·35	950	64·5	57·0	7·5	50·8							
	8 18 0 ,,	......	......	29·35	950	64·5	57·0	7·5	50·8							
	8 18 15 ,,	......	......	29·42	883	64·8	57·0	7·8	50·6							
	8 18 30 ,,	......	......	29·48	825	64·8	57·0	7·8	50·6							
	8 19 0 ,,	......	......	29·52	789	64·8	57·2	7·6	51·0							
	8 19 30 ,,	......	......	29·55	760	64·2	57·1	7·1	51·2							
	8 20 0 ,,	......	......	29·55	760	65·5	57·1	8·4	50·2							
	8 20 15 ,,	......	......	29·50	808	65·2	57·1	8·1	50·5							
	8 20 45 ,,	......	......	29·48	825	65·2	57·2	8·0	50·6							
	8 21 0 ,,	......	......	29·30	998	65·1	57·1	8·0	50·5							
	8 22 0 ,,	......	......	29·05	1,239	64·8	56·1	8·7	49·0							
	8 22 30 ,,	......	......	29·00	1,289	64·8	56·1	8·7	49·0							
	8 23 0 ,,	......	......	28·78	1,502	64·5	56·1	8·4	49·2							
	8 23 30 ,,	......	......	28·70	1,580	64·5	56·0	8·5	49·0							
(3)	8 24 0 ,,	......	......	28·63	1,648	64·5	56·2	8·3	49·4	64·5						
	8 25 0 ,,	......	......	28·58	1,696	64·0	55·3	8·7	48·1							
	8 26 0 ,,	......	......	28·63	1,648	64·2	56·0	8·2	49·2							
	8 27 0 ,,	......	......	28·71	1,570	64·2	56·0	8·2	49·2							
	8 27 30 ,,	......	......	28·85	1,436	64·2	57·0	7·2	51·0							
	8 28 0 ,,	......	......	29·10	1,196	64·2	56·5	7·7	50·1							
	8 29 0 ,,	......	......	29·10	1,196	64·2	56·7	7·5	50·3							
	8 30 0 ,,	......	......	29·30	1,004	64·2	57·1	7·1	51·2							
	8 31 0 ,,	......	......	29·30	1,004	64·2	57·1	7·1	51·2							
	8 31 30 ,,	......	......	29·50	812	64·5	57·1	7·4	51·0							
	8 32 0 ,,	......	......	29·52	793	64·5	57·2	7·3	51·2							
(4)	8 32 30 ,,	......	......	29·65	666	65·1	58·2	6·9	52·6							
	8 33 0 ,,	......	......	29·53	780	65·1	58·2	6·9	52·6							
	8 33 30 ,,	......	......	29·32	980	65·1	57·2	7·9	50·7							
(5)	8 34 0 ,,	......	......	29·21	1,085	65·0	57·1	7·9	50·6							
(6)	8 40 0 ,,															
	8 50 0 ,,	......	......	......	......	68·5										
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Goodwood Park visible; we shall go over it. (2) Bugle again.
(3) Packed up the gridiron thermometer.
(4) Over Goodwood Park; wooded country.
(5) Packed up instruments. (6) On the ground.

Table I.—Meteorological Observations made in the Thirteenth Balloon Ascent, from the Crystal Palace, July 21, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Dry and Wet Thermometers (aspirated). Wet.	Dry and Wet Thermometers (aspirated). Diff.	Dry and Wet Thermometers (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
(1)	....	......	......	......	......	61·5	60·2	1·3	59·0	......	......	......	......	......	......	59·5
	4 50 0 p. m.	......	......	29·52	on the ground.	61·5	61·2	0·3	59·6							
	4 51 0 „	......	......	......	on the ground.	61·3	61·1	0·2	60·9							
(2)	4 52 0 „	......	......	29·51	on the ground.	61·3	61·1	0·2	60·9							
	4 52 10 „	......	......	29·42	on the ground.	60·5	60·0	0·5	59·5							
(3)	4 52 20 „	......	......	29·15	521	60·5	59·3	1·2	58·1							
(4)	4 52 30 „	......	......	28·80	859											
	4 52 40 „	......	......	28·60	1,051	60·0	......	......	......	60·0						
	4 52 50 „	......	......	28·42	1,227	59·1	58·0	1·1	56·9							
(5)	4 53 0 „	......	......	28·20	1,439	58·2	57·1	1·1	56·1							
(6)	4 53 30 „															
(7)	4 54 0 „	......	......	27·95	1,681	57·5	56·2	1·3	54·9							
(8)	4 54 30 „	......	......	27·70	1,823	56·5	55·5	1·0	54·5	56·5						
	4 54 40 „															
(9)	4 55 0 „	......	......	27·42	2,095	56·0	56·0	0·0	56·0							
(10)	4 55 20 „															
(11)	4 55 30 „	......	......	27·25	2,351	54·8	54·8	0·0	54·8							
(12)	4 55 40 „															
(13)	4 56 0 „	......	......	27·05	2,589	54·0	54·0	0·0	54·0							
	4 56 30 „	......	......	26·90	2,740	53·5	53·5	0·0	53·5	53·5						
	4 57 0 „	......	......	26·80	2,845	54·2	54·2	0·0	54·2	54·0						
	4 57 30 „	......	......	26·90	2,740	54·0	54·0	0·0	54·0							
	4 58 0 „	......	......	26·95	2,790	54·2	54·2	0·0	54·2	......	......	......	......	......	......	54·5
(14)	4 58 30 „	......	......	27·05	2,589	53·5	53·5	0·0	53·5							
(15)	4 59 0 „	......	......	......	(2,556)	53·2	53·2	0·0	53·2							
(16)	4 59 30 „	......	......	......	(2,523)	53·7	53·5	0·2	53·3							
(17)	5 0 0 „	......	......	27·15	2,488	55·0	55·0	0·0	55·0							
(18)	5 0 30 „															
(19)	5 1 0 „	......	......	27·03	2,610	55·0	55·0	0·0	55·0	55·0	......	......	......	......	......	55·0
	5 1 15 „															
	5 1 30 „	......	......	26·95	2,700	54·5	54·5	0·0	54·5							
	5 2 0 „	......	......	26·80	2,850	54·2	54·2	0·0	54·2	......	......	......	......	......	......	54·0
(20)	5 2 15 „															
(21)	5 2 30 „	......	......	26·75	2,900	53·9	53·8	0·1	53·7	53·8						
	5 2 45 „															
	5 3 0 „	......	......	26·75	2,900	53·5	53·3	0·2	53·1	......	......	......	......	......	......	53·0
(22)	5 3 10 „															
(23)	5 3 15 „															
	5 3 30 „	......	......	26·68	2,967	53·5	53·0	0·5	52·5							
	5 4 0 „	......	......	26·70	2,945	53·5	52·5	1·0	51·5							
(24)	5 5 0 „	......	......	26·75	2,890	53·7	52·2	1·5	50·7	......	......	......	......	......	......	52·0
(25)	5 6 0 „	......	......	26·85	2,750	53·5	53·2	0·3	52·9							
(26)	5 7 0 „															
(27)	5 7 30 „	......	......	27·10	2,535	53·5	53·2	0·3	52·9							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) Sky overcast, wind S. by E.
(2) Drops of rain as large as fourpenny pieces.
(3) Balloon left the earth.
(4) Entered clouds.
(5) Earth out of sight on three sides; Crystal Palace still visible.
(6) In clouds; clouds very light; earth entirely out of sight.
(7) Gas let out; clouds very light.
(8) Gas let out; very cloudy.
(9) Gas very cloudy.
(10) Train heard.
(11) In dry cloud.
(12) In white cloud.
(13) Darker above than below.
(14) In dense fog.
(15) Gas getting clearer.
(16) Sand out.
(17) Hammering heard.
(18) Hum of London heard; bell tolling.
(19) Heard railway whistle.
(20) Clouds above darker than those below; can see the white edge of lower cloud.
(21) Out of cloud.
(22) Earth visible through a break in the clouds.
(23) Docks visible below.
(24) Docks and River Thames visible; over Greenwich; ships visible.
(25) Over West India Docks.
(26) In open space; lower clouds moving N.E., and much faster than we are.
(27) Wind S.W.; moving N.E.

TABLE I.—Meteorological Observations made in the Thirteenth Balloon Ascent, from the Crystal Palace, July 21, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	5 7 45 p.m.	......	......	27·20	2,440	54·2	53·5	0·7	52·8	54·2						
	5 8 0 „	......	......	27·30	2,340	54·2	53·5	0·7	52·8							
(1)	5 8 15 „	......	......	27·35	2,290	54·2	53·5	0·7	52·8							
(2)	5 8 30 „	......	......	27·50	2,133	55·1	54·2	0·9	53·3							
(3)	5 8 45 „															
(4)	5 9 0 „	......	......	27·60	2,020	55·0	54·2	0·8	53·4	55·0						
	5 9 30 „	......	......	27·78	1,840	55·5	54·1	1·4	52·7							
	5 9 45 „	......	......	27·80	1,820	55·5	54·0	1·5	52·5							
(5)	5 10 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	53·0
	5 10 30 „	......	......	28·00	1,635	56·0	55·1	0·9	54·3							
(6)	5 10 45 „	......	......	......	......	56·2	55·1	1·1	54·1	56·2						
	5 11 0 „	......	......	28·20	1,430	56·2	55·8	0·4	55·4							
(7)	5 11 30 „	......	......	28·33	1,300	56·2	56·0	0·2	55·8							
(8)	5 12 0 „	......	......	......	(1,120)	57·2	56·5	0·7	55·8							
(9)	5 12 15 „	......	......	28·70	1,030	57·8	......	......	......	57·8						
(10)	5 12 30 „															
	5 13 0 „	......	......	28·80	859											
	5 13 30 „	......	......	28·70	955											
	5 14 0 „	......	......	28·60	1,051	57·2	57·2	0·0	57·2							
	5 14 30 „	......	......	28·50	1,147	57·5	57·5	0·0	57·5							
(11)	5 15 0 „	......	......	28·40	1,241	57·5	57·5	0·0	57·5	57·5	......	......	......	......	......	58·0
	5 15 15 „	......	......	28·05	1,579	56·2	56·2	0·0	56·2							
	5 15 30 „	......	......	27·80	1,739	55·5	55·5	0·0	55·5							
	5 15 45 „	......	......	27·75	1,789	54·8	54·8	0·0	54·8							
(12)	5 16 0 „	......	......	27·65	1,890	54·2	54·2	0·0	54·2	54·2						
	5 16 15 „	......	......	27·30	2,240											
	5 16 30 „	......	......	27·30	2,240	......	......	......	......	......	......	......	......	......	......	54·5
	5 17 0 „	......	......	......	......	54·2	54·0	0·2	53·8	54·3						
	5 17 30 „	......	......	27·10	2,526	54·0	53·5	0·5	53·0							
	5 18 0 „	......	......	26·90	2,732	55·0	54·0	1·0	53·0							
	5 18 30 „	......	......	26·70	2,938											
	5 19 0 „	......	......	26·55	3,086	53·5	53·0	0·5	52·5							
(13)	5 19 30 „	......	......	26·42	3,220	53·0	52·2	0·8	51·4							
	5 20 0 „	......	......	26·40	3,242	53·2	52·0	1·2	50·8							
(14)	5 20 30 „	......	......	26·35	3,298	53·2	52·5	0·7	51·8	......	......	......	......	......	......	51·5
(15)	5 20 45 „	......	......	26·38	3,256											
	5 21 0 „	......	......	26·39	3,234	53·5	52·1	1·4	50·7							
(16)	5 21 30 „	......	......	26·40	3,218	52·5	51·8	0·7	51·1							
	5 22 0 „	......	......	26·50	3,138	52·2	51·5	0·7	50·8							
(17)	5 22 30 „	......	......	26·50	3,138	52·2	52·2	0·0	52·2							
(18)	5 23 0 „	......	......	26·70	2,924											
	5 23 15 „	......	......	26·75	2,870	52·2	52·2	0·0	52·2	......	......	......	......	......	......	52·0
	5 23 30 „	......	......	26·95	2,654											
(19)	5 24 0 „	......	......	27·30	2,386	54·0	53·5	0·5	53·0	54·1						
	5 24 30 „	......	......	27·45	2,234											
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) In cloud.
(2) Over high road; scud below moving apparently much faster than the balloon.
(3) See the earth through a thin layer of cloud.
(4) Over a field; detached clouds below; we are moving in an opposite direction to that in which we were moving recently.
(5) Scud below moving very fast.
(6) Passing below lower stratum; over River Lea.
(7) Over Walthamstow; carts visible.
(8) Nearly over Victoria Park.
(9) Over East London Cemetery.
(10) Lowering grapnel.
(11) In fog.
(12) In cloud.
(13) Clouds on same level as ourselves; some below; darker above; gas thick and opaque railway whistle heard.
(14) Large masses of cumulus cloud below; light below.
(15) Light below; dark above.
(16) In fog.
(17) Fine rain falling; grapnel visible plainly; misty all round.
(18) In wetting fog.
(19) Very fine rain falling; clouds blackish below; earth visible; water dropping from the balloon; scud below.

Table I.—Meteorological Observations made in the Thirteenth Balloon Ascent, from the Crystal Palace, July 21, 1863.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Negretti and Zambra's Gridiron Thermometer.	Dry and Wet Thermometers (aspirated).				Hygrometers.	
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°
	5 25 0 p.m.	......	......	27·50	2,180	55·0	54·2	0·8	53·4							
	5 26 0 „	......	......	27·70	1,960	55·5	54·1	1·4	52·7							
(1)	5 26 30 „															
(2)	5 27 0 „	......	......	28·00	1,626											
(3)	5 28 0 „	......	......	28·60	1,044	59·0	59·0	0·0	59·0	59·2						
	5 28 30 „	......	......	28·65	995	61·0	61·0	0·0	61·0							
(4)	5 29 0 „	......	......	28·66	987	61·2	61·2	0·0	61·2							
	5 29 30 „	......	......	28·70	948	61·1	61·1	0·0	61·1	......	......	......	......	......	......	61·5
	5 30 0 „	......	......	28·75	900	61·5	61·5	0·0	61·5	61·6						
	5 30 30 „	......	......	28·75	900	61·5	61·5	0·0	61·5							
(5)	5 31 0 „	......	......	28·95	706	61·8	61·8	0·0	61·8	62·0						
	5 31 30 „	......	......	29·00	651											
	5 32 0 „	......	......	29·00	651	61·5	61·5	0·0	61·5							
	5 32 30 „	......	......	28·90	755											
(6)	5 32 45 „	......	......	28·72	929	60·5	60·5	0·0	60·5							
	5 33 0 „	......	......	28·45	1,179											
	5 33 15 „	......	......	28·33	1,300	58·5	58·5	0·0	58·5							
(7)	5 33 30 „															
(8)	5 34 0 „	......	......	27·90	1,714	57·2	57·2	0·0	57·2	57·3						
(9)	5 34 15 „	......	......	27·60	1,960	57·5	57·2	0·3	56·9							
	5 34 30 „	......	......	27·60	1,960	57·5	57·5	0·0	57·5							
	5 34 45 „	......	......	27·60	1,960	57·5	57·5	0·0	57·5							
(10)	5 35 0 „	......	......	27·68	1,898	57·5	57·5	0·0	57·5	57·5						
	5 35 30 „	......	......	27·78	1,801	57·8	57·8	0·0	57·8							
(11)	5 35 45 „	......	......	27·80	1,780	58·5	58·5	0·0	58·5							
(12)	5 36 0 „	......	......	28·00	1,635	58·9	58·9	0·0	58·9							
(13)	5 36 30 „	......	......	28·18	1,455	58·6	58·6	0·0	58·6	58·7						
(14)	5 37 0 „	......	......	28·30	1,330	59·2	59·0	0·2	58·8							
	5 37 30 „	......	......	28·50	1,131	59·5	59·5	0·0	59·5							
	5 37 45 „	......	......	28·60	1,041											
(15)	5 39 0 „	......	......	28·65	996	60·0										
	5 39 45 „															
	5 40 0 „	......	......	28·70	951	60·9										
	5 41 0 „	......	......	28·75	906	61·3										
	5 42 0 „	......	......	29·05	636	61·5										
(16)	5 43 0 „	......	......	29·35	313	61·5										
	5 45 0 „	......	......	29·58	ground	61·5	60·5	1·0	59·5							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.

(1) In black cloud; earth invisible; darker below than above; gas beautifully clear; can see netting through the balloon.
(2) The drops of rain are very minute, as fine as pins' points.
(3) In clouds; grapnel scarcely visible.
(4) Still in cloud; can hear the tinkling of bells; can hear the noise made by the rain pattering on the trees of Epping Forest.
(5) Can see the road through the Forest; scud below; road nearly invisible.
(6) Scud far below. (7) Earth invisible; clouds above darker than below.
(8) Packed up Daniell's Hygrometer. (9) Gas thick and opaque; grapnel invisible.
(10) The grapnel and half of the rope are invisible.
(11) The grapnel is just visible; rain pattering on the balloon.
(12) Rain-drops about $\frac{1}{18}$th of an inch in diameter.
(13) Earth visible; scud below moving at a greater rate than we are.
(14) In cloud; very dark; earth invisible; wind blowing in my face.
(15) Changed direction; passing over Wood; can see sheep clearly.
(16) Grapnel dragged through two trees, breaking off branches, &c., then through a pond, and finally caught in the bank. The descent was effected in a corn-field, and various efforts were made to bring the balloon out; but owing to the strength of the wind, the united strength of ten or twelve men was insufficient to get it over the hedge and keep it there.

§ 4. Adopted Temperatures of the Air, the Wet-Bulb, and the Dew-Point, in Five Balloon Ascents.

Table II.—Showing the adopted Reading of the Barometer, calculated Height above the Sea, Temperature of the Air, Temperature of the Wet-bulb Thermometer, and Temperature of the Dew-point in the ninth, tenth, and eleventh Ascents.—Ninth Ascent.—March 31.

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°
4 11	29·72	420	49·8	44·2	38·2
14	29·72	420	49·2	44·2	38·8
16	29·39	780	47·5	41·3	34·5
17	29·10	1048	47·2	40·8	33·7
18	28·60	1515	46·0	38·1	29·1
20 30	....	....	38·6		
21	26·56	3507	37·5	33·0	26·8
21 30	26·36	3698	38·5	32·0	23·2
23	25·31	4771	37·0	30·0	20·1
24	24·82	5296	35·5	29·2	19·5
25	24·22	5937	34·3	26·1	11·6
27	23·52	6251	33·2	26·0	11·6
27 30	23·22	7035	33·0	25·1	9·3
28	22·92	7380	32·6	24·9	8·2
29	22·75	7557	32·1	24·8	7·9
32	21·63	8872	28·5		
33	21·33	9218			
35	20·63	10047	27·3	20·2	−12·5
40	18·73	12536	21·1		
41	18·33	13070	19·1	10·1	−55·9
43	17·34	14481	15·1	6·1	−63·6
44	16·84	15198	14·2	5·1	−63·5
44 30	16·49	15738	12·2	4·2	−58·0
45	....	(15793)	12·2	4·0	−58·2
46 30	15·95	16669	11·1	5·2	−40·7
47	15·63	17060	9·0	2·0	−52·4
48	15·45	17451	9·0	3·0	−43·6
49	15·35	17616	8·5	3·0	−39·7
49 30	14·86	18475			
50	14·96	18304	11·1	7·2	−23·3
51	15·06	18123	11·0	7·1	−23·4
52	15·46	17400			
58 30	15·67	17097	12·1	9·1	−14·2
59 30	15·67	17097			
5 2	15·36	17636	11·0	8·0	−15·2
4	14·96	18293	10·5	6·0	−29·0
6	14·66	18730	9·3	2·5	−50·3
6 30	14·62	18795	8·2	2·0	−46·0
7	....	....	7·0	2·5	−32·6
8 50	14·37	19197			
10	14·27	19356	3·0	− 0·5	−28·7
12	13·47	20865			
14	13·87	20076			
15	13·82	20136			
16	13·68	20374	2·0	− 0·5	−20·6
20	13·18	21331	2·0	− 0·1	−17·0
23	13·48	20749			
24	13·38	20910	1·0	− 3·0	−35·0
25	12·88	21868	0·5	− 3·5	−35·7
26	12·78	22068			
27	12·38	22884	0·5	− 4·0	−35·4
31	15·98	16486	3·1		
32	16·09	16309	4·1		

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°
5 33	15·78	16809			
34	16·83	15149	7·5		
35	16·88	15080	8·2		
37	16·88	15080			
38	16·58	15556	11·1	9·1	− 6·4
41	16·57	15565	9·1	6·2	− 6·3
42	16·37	15872	9·3	5·1	−27·5
42 30	16·47	15714	9·1	5·2	−35·1
43	16·13	16080	9·1	5·1	−26·0
45	16·13	16080	9·1	5·1	−26·0
46	16·17	16080	8·0	5·1	− 7·4
47	16·17	16080			
47 40	16·17	16080	7·2	3·1	−28·7
49	16·37	15847	7·2	3·1	−28·7
50	....	(15775)	7·2	3·1	−28·7
52	16·47	15630	7·0	3·0	−28·1
52 30	16·57	15489			
53	16·77	15227			
54	16·97	14965	7·0	6·0	− 1·8
55	17·17	14622	7·0		
56	17·37	14325	8·5	7·0	− 4·6
56 30	17·37	14325	9·0	7·0	− 8·5
57	17·88	13614	10·8	7·1	−21·5
58	18·27	13077	11·7	8·4	−17·4
58 30	18·47	12797	12·2	10·1	− 6·2
59	18·87	12232			
6 1	19·28	11674	13·5	11·1	− 7·5
2	19·47	11486	14·5	11·2	−14·4
3	19·87	10917			
5	20·97	9570	19·0		
8	22·38	7907	21·2	17·0	−11·8
9	22·78	7443	21·5		
9 30	....	(7050)	22·2	18·0	− 9·7
10	23·48	6657	23·0	19·5	− 2·4
11	23·78	6279	24·2	20·5	− 1·3
11 30	24·18	5901	24·8	21·0	0·0
12	24·38	5696	25·1	21·2	+ 9·7
13	24·77	5273	25·5	22·0	3·5
14	....	(4910)	25·9	22·0	2·2
14 30	25·29	4729	26·9	22·0	1·7
15	25·57	4441	28·0	23·0	3·3
16	25·87	5168			
17	26·48	3528	28·2	24·4	13·9
19	26·87	3143	28·5	26·1	16·9
20	27·07	2950	29·5	26·2	15·1
21	27·46	2570	30·0	27·2	18·4
22	27·96	1908	30·0	27·5	19·7
22 30	28·16	1724	30·9	27·5	18·4
23	28·36	1590	31·5	28·0	19·9
24	28·86	1260	32·2	28·5	20·0
25	29·06	1070	32·8	29·0	20·4
25 30	29·50	893	35·0		
30	29·89	ground	42·0		

Between 4h 27m and 5h 56m I failed in obtaining any deposition of dew on either Daniell's or Regnault's hygrometer, but the wet-bulb acted very satisfactorily during these times, and indicated the very low readings inserted in the Table.

Table II. (*continued.*)—Tenth Ascent.—April 18.

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°
0 12	29·80	....	61·0	55·2	50·2
15	29·80	....	59·5	53·5	48·3
1 13	29·66	....	60·8	54·5	49·1
14	29·66	....	61·5	54·2	47·8
17−	29·17	1030	59·2	54·0	48·4
17+	28·57	1603	57·2	51·1	45·5
18	27·97	2185	56·0	50·5	45·4
18 30	....	(2380)	55·2	49·0	43·1
19	27·57	2575	54·0	48·0	42·2
20	26·75	3555	49·2	43·0	36·4
21 10	25·79	4392	47·2	41·0	34·1
22 30	24·50	5759	41·2	35·1	27·5
24	....	....	40·5	37·0	33·6
24 15	23·90	6420	39·0		
24 30	23·61	6744	37·0	35·2	32·6
25 30	23·21	7180	34·5	33·2	31·1
26	22·77	7694	32·8		
27 30	22·70	7764			
29	20·85	10020	32·0	25·8	12·1
29 30	20·63	10342			
30	20·12	11055	31·5	24·2	5·9
32	19·13	12259	23·2		
32 30	....	(12600)	23·0		
33	....	....	23·0		
34	18·35	13340	23·2		
34 10	17·95	14030	21·0		
35	....	(14600)	21·0		
35 30	17·24	14986	20·0		
40	16·25	16504	17·2	13·0	−19·0
42	15·86	17057	12·0	6·0	−20·6
43	15·81	17140	12·1	5·1	−49·3
47	15·46	17749	12·0	5·0	−49·5
48	15·81	18886	12·0	4·5	−53·8
49	14·81	18886	12·0	4·9	−50·3
50	....	(19140)	11·8	5·7	−41·6
52	14·37	19644	10·5		
52 50	14·15	20163	11·5		
54	14·15	20163	11·3	6·0	−35·2

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°
1 55	14·05	20338			
56	14·05	20338			
2 0	13·75	20943	13·0	5·0	−57·1
2	14·05	20428			
9	13·65	21120	14·2		
10	....	....	15·0	3·0	90·0
11	....	....	14·5		
12	13·35	21646	13·0		
13	13·30	21760			
14	13·30	21760	16·5		
15	13·25	21869	..	..	13·2
15 30	13·20	22041	13·0	6·2	−69·7
22 30	12·75	22954	12·0	0·0	−97·2
27	12·60	23258	12·3		
28	....	23460	12·0		
28 30	12·50	23460	12·0		
29	12·50	23461			
29 30	12·48	23500			
30	12·50	23460			
30 30	13·35	23753	12·5	0·5	−92·8
31	12·45	23539	12·2		
33	12·65	23109	12·1		
33 10	12·75	22907	12·5	1·0	−88·4
33 30	13·35	21765			
33 45	13·55	21381			
34	13·65	21189			
37 30	16·64	15998	15·7	7·0	−55·6
38 30	17·24	14967			
39	....	(14670)	16·7	8·8	−51·4
40	17·64	14311			
40 30	18·14	13590	16·5	10·0	−39·7
41 30	....	....	17·0	14·5	− 4·5
42	19·94	11100	18·0	15·5	− 3·2
43	20·04	11003	20·2	18·1	+ 4·6
43 30	20·24	10785	24·2	19·0	−10·6
44	20·94	9609	26·1	20·0	−10·4
48	....	ground	..	20·0	

The rope connecting us with the earth broke; I was consequently thrown, by this sudden departure, among the instruments, and both Daniell's and Regnault's Hygrometers were broken; I was therefore solely dependent on the Wet-bulb Thermometer, whose action was throughout good.

N.B. From all the observations of the temperature of the air, the wet-bulb, and the dew-point in the preceding Tables, a determination was made of these elements, with the corresponding readings of the barometer and heights. Some of the numbers in the column for heights have been interpolated when either of these elements have been observed without a corresponding observation of the barometer. The numbers thus found are within brackets. The results are contained in the Tables in pp. 472–475.

TABLE II. (*continued.*)—ELEVENTH ASCENT.—June 26.

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°	h m s	in.	feet.	°	°	°
1 2	29·70	ground				1 36	15·33	18291			
3	....	....	66·0	57·0	49·8	36 20	15·23	18435	29·2	21·2	− 7·8
4	29·15	884	65·0	56·0	48·7	36 30	15·23	18435	..	..	−10·1
4 30	28·57	1445	62·0	54·0	47·2	36 45	15·13	18555	26·2	21·0	− 5·0
6	....	....	61·8	53·5	46·4	37	15·15	18560	25·0	19·0	−14·1
6 15	28·36	1660	61·5	53·1	45·9	38	....	(18790)	25·0	18·5	−17·4
6 30	27·86	2150	59·5	51·5	44·4	39	14·83	19018	21·8		
7	27·36	2651	57·2	51·2	45·7	40	14·73	19178	20·6	16·2	−14·6
7 20	....	(3029)	55·0	49·8	44·9	40 40	....	(19420)	20·5	16·0	−15·5
8	....	(3785)	51·0			41	14·53	19544	..	..	−11·0
8 10	27·45	(3974)	50·5			41 10	14·53	19544	20·0	16·0	−12·5
8 50	25·27	4729	48·5			41 45	14·33	19909	20·5	16·0	−15·5
9	24·87	5264	47·0	40·0	32·2	42	14·23	20167	21·1	16·0	−19·0
10	24·58	5578	44·0			42 30	14·24	20167	21·1	16·0	−19·0
11	23·79	6477				43	13·95	20648	21·0	16·0	−18·4
13	....	(7300)	41·2	31·0	18·1	43 30	....	....	19·1	16·1	− 5·9
13 30	22·80	7510	39·0	29·2	16·3	44	13·94	20648	20·0	16·0	−12·5
14	....	(7940)	37·2	26·1	10·4	45	13·84	20854	..	..	−13·0
15	21·82	8796			11·0	46	13·64	21266	22·0	16·1	−22·8
15 20	....	(8827)	36·0	26·1	11·3	47	13·59	21357	22·0	16·0	−23·6
16	21·65	8888				48	13·34	21978			
16 30	20·75	9298	31·2	..	8·0	49	13·24	22053			
17	20·65	9800	31·5			50	13·24	22053	22·0	16·0	−23·6
17 15	20·20	10800				51	13·20	22073	21·8	16·0	−22·2
17 30	20·22	10804				53	13·14	22105			
17 45	19·93	11204	30·0			53 30	13·14	22105	19·2	16·1	− 6·5
18	19·75	11478				53 40	....	....	..	..	− 3·5
18 20	19·83	11341	31·1			54	12·89	22664	18·5		
19	19·23	12177				54 30	....	(23023)	18·5	16·0	− 2·5
19 30	19·05	12459				54 40	12·66	23143	18·0		
20	18·83	12743	30·5	30·5	30·5	54 50	....	(23200)	17·0	16·2	+ 2·5
20 10	18·53	13173				55	13·04	22965	18·5	18·0	+14·3
21	18·13	13764				58	13·14	22168	19·1	..	+ 2·0
21 10	18·03	13913	31·0	31·0	31·0	58 30	13·54	21457	23·0	..	+ 2·0
23	17·63	14530	32·0	29·0	22·1	59	13·65	21302			
24	17·13	15295				2 0	13·85	20934	26·1	20·6	0·0
25	16·93	15598	30·0	29·0	25·9	1	14·25	20167			
25 20	16·83	15757	30·0	29·0	25·9	2	14·25	20167	26·1	22·0	+ 1·2
26	16·73	15935	29·0	26·0	15·2	2 30	14·25	20167	26·1		
27	16·63	16079	30·0	26·0	13·4	2 45	14·25	20167	29·2		
28	16·63	16079	32·0	27·6	12·1	3	14·44	19901	31·0	24·0	+ 5·1
29	16·53	16274	32·0	27·0	(11·3)	4 30	14·64	19367	23·0	22·0	
29 20	....	(16274)	33·0	28·5	19·5	4 45	....	....	..	..	15·0
29 30	16·53	16274				5	14·44	19901	23·0	21·5	15·8
29 45	16·40	16486	35·0	30·0	22·0	6 10	....	....	23·0	21·0	12·7
30	....	(16548)	35·0	29·8	21·5	6 20	14·34	20025	23·0		
31	16·23	16796				6 45	....	....	25·0	23·0	12·0
31 30	16·15	16870	34·5	29·2	17·4	7	14·04	20630	28·9	23·0	1·5
32	16·03	17144	34·5			7 30	14·34	20025	28·1	23·7	5·6
32 10	16·03	17144	34·5			8	14·64	19367	27·5	23·4	5·4
32 30	16·03	17144	34·5			8 30	14·84	19089			
33	15·93	17242				9	15·04	18746	28·0	24·0	7·6
33 30	15·88	17339	34·3			9 30	....	....	29·2	23·1	1·1
34	15·83	17479	34·2	28·1	17·4	10	15·34	18235			
35	15·83	17479				10 15	....	....	29·0	23·5	4·6
35 30	15·49	18053	33·0	23·1	3·3	10 20	....	....	29·0	23·0	1·2

TABLE II. (*continued*).—ELEVENTH ASCENT.—June 26 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°	h m s	in.	feet.	°	°	°
2 10 45	15·54	17888	29·5	24·5	7·5	2 16 30	20·05	....	33·0	27·5	16·4
11	16·04	17422	29·5	24·5	7·5	17	20·44	10508	33·0	27·0	14·9
11 15	16·24	16776	31·0			18	20·77	10011	33·0	26·5	13·4
11 30	16·35	16594				19	20·77	10011	33·5	26·0	11·8
11 45	....	....	31·5	26·0	12·2	19 30	20·89	9917			
12	16·44	16412	32·0	26·2	12·1	19 45	21·29	9402			
12 30	....	....	32·5	26·2	12·6	20 20	21·49	9148	33·5	26·0	11·8
13	16·84	15762	32·0	27·0	15·4	20 30	22·33	8107	34·5	27·2	14·9
13 15	16·95	15602				21	24·25	(5870)	38·0		
13 30	16·99	15521	31·5	27·0	15·7	22	24·72	5319	39·2	33·0	24·8
14	17·39	14892	33·0			23	....	....	42·0	35·1	26·6
14 15	....	....	33·0	27·0	14·9	24	....	....	43·0	37·0	29·8
14 30	17·64	14501				25	25·81	4138			
14 45	17·84	14197	33·0			25 30	26·60	3394	46·2	43·1	39·6
14 50	18·04	13896	33·0	29·2	21·6	26	26·70	3293	47·0	43·0	38·5
15	....	....	33·0	29·2	21·6	27	28·18	1810			
15 10	18·74	12865	33·0			27 30	28·76	1259			
15 30	19·04	12433	33·0			28	29·26	779			
15 45	....	....	33·0	29·5	22·5	28+	30·10	ground	66·5	60·0	54·7
16	19·77	11412									

The readings of the Gridiron thermometer were taken occasionally only in the twelfth and thirteenth ascents, as checks on the accuracy of temperature as shown by the dry-bulb thermometer, and no combination of readings is necessary in these ascents for adopted temperatures, &c., and therefore in subsequent calculations the readings as they appear in Table I. are used.

§ 5. VARIATION OF TEMPERATURE OF THE AIR WITH HEIGHT.

Every reading of temperature in the preceding Tables, or the means of small groups of readings when observations have been taken near to each other, was laid down on diagrams; all these points were joined, and a curved line was drawn to pass through or near to them, giving them equal weight, and by this means every change was made evident to the eye.

In all these curves there were parts of the same curve showing a gradual decrease of temperature with increase of elevation, and a gradual increase of temperature with decrease of elevation. The curve of which these were parts was assumed to be the true curve of normal temperature freed from disturbing causes, and the deviation from this curve indicated the places of disturbance and their amounts. The next step was the reading from these curves the temperature at every thousand feet, and in this way the next Tables were formed.

The numbers in the first column show the height in feet, beginning at 0 feet and increasing upwards; the numbers in the second column show the interval of time in ascending to the highest point; the notes in the third column show the circumstances of the observations; the numbers in the fourth and fifth columns the observations and the approximate normal temperatures of the air; and those in the next column the difference between the two preceding columns, or the most probable effect of the presence of cloud or mist on the temperature, or of other disturbing causes in operation.

The next group of columns are arranged similarly for the descent, and the other groups for succeeding ascents and descents.

TABLE III.—Showing the Temperature of the Air, as read off the curve drawn through the observed temperatures, and as read off the curve of most probable normal temperature, called adopted temperature, and the calculated amount of disturbance from the assumed law of decrease of temperature.

NINTH ASCENT.

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
March 31.			°	°	°			°	°	°
23000	From 4h 10m to 5h 27m p.m.	Clear blue sky.	1·0	0·0	+ 1·0	From 5h 27m to 6h 30m p.m.	Cloudless.	1·0	0·0	+ 1·0
22000			1·5	1·0	+ 0·5			1·0	0·3	+ 0·7
21000			2·0	2·2	− 0·2			1·4	1·1	+ 0·3
20000			3·0	4·0	− 1·0			1·7	1·8	− 0·1
19000			6·5	5·9	+ 0·6			1·9	2·2	− 0·3
18000			10·7	8·0	+ 2·7			2·2	3·0	− 0·8
17000			9·8	9·9	− 0·1			2·6	4·0	− 1·4
16000			12·0	12·0	0·0			5·5	5·5	0·0
15000			14·3	14·0	+ 0·3			6·9	7·2	− 0·3
14000			16·0	16·0	0·0			10·4	9·4	+ 1·0
13000			18·8	18·0	+ 0·8			12·0	11·4	+ 0·6
12000			18·0	20·3	− 2·3			13·4	13·5	− 0·1
11000			22·0	22·9	− 0·9			15·7	15·5	+ 0·2
10000			26·3	25·6	+ 0·7			17·8	17·4	+ 0·4
9000			28·1	27·9	+ 0·2			19·3	19·0	+ 0·3
8000			30·8	30·1	+ 0·7			21·0	21·0	0·0
7000			33·0	32·3	+ 0·7			22·8	22·8	0·0
6000			35·8	34·5	+ 1·3			24·7	24·5	+ 0·2
5000			36·0	36·7	− 0·7			25·9	26·0	− 0·1
4000		Misty.	38·2	38·9	− 0·7			28·0	27·7	+ 0·3
3000			39·6	41·0	− 1·4			29·2	29·5	− 0·3
2000			44·0	44·0	0·0			30·0	31·5	− 1·5
1000			47·2	47·0	+ 0·2			33·5	34·8	− 1·3
0			..	51·9	....			42·0	42·0	0·0

March 31.—The sky was clear, and the amounts of deviation of temperature on either side of the adopted curve-line were generally small, both during the ascent and descent of the balloon.

On ascending, there was a curious warm stratum of air between 17,000 and 19,000 feet high, and a similar one was met with on descending, between 15,000 and 15,500 feet high.

TABLE III. (*continued.*)

TENTH ASCENT.

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
April 18.			°	°	°			°	°	°
24000	From 1h 14m to 2h 30m p.m.	Above cloud.	......	......	......	From 2h 30m to 2h 44m p.m.	Above cloud.	......		
23000			12·4	12·0	+ 0·4			12·5		
22000			13·0	12·2	+ 0·8			12·9		
21000			14·0	12·5	+ 1·5			13·2		
20000			12·0	13·0	− 1·0			13·5		
19000			12·0	13·5	− 1·5			14·0		
18000			12·0	14·2	− 2·2			14·3		
17000			12·0	15·7	− 3·7			14·6		
16000			18·3	17·6	+ 0·7			15·3		
15000			20·0	19·6	+ 0·4			16·6		
14000			21·0	21·7	− 0·7			16·3		
13000			23·0	24·0	− 1·0			17·0		
12000			24·0	26·1	− 2·1			18·0		
11000			31·8	28·2	+ 3·6			20·0		
10000			32·0	30·5	+ 1·5			25·5		
9000		In cloud or mist.	32·1	32·5	− 0·4					
8000			32·5	34·9	− 2·4					
7000			35·6	37·8	− 2·2					
6000			41·0	41·0	0·0					
5000			45·0	45·0	0·0					
4000			47·9	48·6	− 0·7					
3000		Below cloud.	52·3	52·3	0·0					
2000			56·7	55·8	+ 0·9					
1000			59·5	59·5	0·0					
0			..	63·2	......					

April 18.—The sky was cloudy; the amount of deviation of temperature was very small till the height of 7000 feet was reached, when a cold current was met with in the cloud; on passing out of the cloud a warm stratum was passed, and then alternating warm and cold currents were passed, but the amount of deviation was never large. The descent was so rapid that no conclusions can safely be drawn from the observations in these respects.

TABLE III. (*continued.*)

ELEVENTH ASCENT.

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
June 26.			°	°	°			°	°	°
23000	From $1^h\ 3^m$ to $1^h\ 55^m$ p.m.	Clouds still above, faint blue sky.	18·5	18·0	+ 0·5	From $1^h\ 55^m$ to $2^h\ 28^m$ p.m.	Clouds above.	18·7	17·8	+ 0·9
22000		In fog.	22·0	18·7	+ 3·3		Fog.	19·5	18·8	+ 0·7
21000		Again in fog, cirri above.	21·5	19·5	+ 2·0			26·0	19·7	+ 6·3
20000			20·3	20·3	0·0		Faint surf.	26·1	21·2	+ 4·9
19000		Just above cloud, faint blue sky; cloud on our lee.	24·0	21·2	+ 2·8			28·9	22·0	+ 6·9
18000		Cold dry thin fog.	33·5	22·5	+11·0			29·1	23·5	+ 5·6
17000			34·5	23·8	+10·7		Rain.	30·5	24·8	+ 5·7
16000		In fog.	32·0	25·1	+ 6·9			32·0	25·8	+ 6·2
15000		In dry fog.	30·5	26·5	+ 4·0			33·0	27·0	+ 6·0
14000			30·8	27·8	+ 3·0			33·0	28·0	+ 5·0
13000		In fog.	30·5	29·1	+ 1·4		Snow.	33·0	29·2	+ 3·8
12000		Sun seen faintly.	30·5	30·5	0·0			33·0	30·4	+ 2·6
11000		In fog.	31·0	31·9	− 0·9			33·0	31·6	+ 1·4
10000		Thin rain.	33·8	33·5	+ 0·3		Very murky and thick atmosphere.	33·3	32·8	+ 0·5
9000			36·0	35·0	+ 1·0			33·9	33·7	+ 0·2
8000			37·0	37·5	− 0·5			34·8	34·8	0·0
7000			40·5	40·0	+ 0·5			36·9	36·6	+ 0·3
6000			43·0	43·0	0·0			38·0	38·2	− 0·2
5000			48·8	47·9	+ 0·9			41·5	41·0	+ 0·5
4000			51·9	51·9	0·0			44·6	44·3	+ 0·3
3000			55·8	55·8	0·0			48·8	48·8	0·0
2000			60·7	60·0	+ 0·7			54·6	54·6	0·0
1000		Very dark.	64·7	63·8	+ 0·9			60·7	60·7	0·0
0			..	68·0	..			66·7	66·7	0·0

June 26.—The morning of this day was very hot and fine; at the time of leaving the earth the sky was cloudy, and there was a continued succession of strata of dry and wet fogs, of warm and cold currents; and rain and snow were both met with; the former at the height of 10,000 feet on ascending, and at 14,000 feet on descending, the snow being situated below the rain on descending, at the height of 13,000 feet.

Between 14,000 feet and 20,000 feet there was a very remarkable warm current, and another, but to a less amount, at 22,000. On descending, whilst passing through rain and snow, or between 10,000 and 17,000 feet, there was scarcely any change of temperature. The results of this day are anomalous.

TABLE III. (*continued.*)

TWELFTH ASCENT.

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
July 11.			°	°	°			°	°	°
4000	From $4^h\ 53^m$ to $5^h\ 10^m$ p.m.	Thick atmosphere.	61·0	59·1	+ 1·9	From $5^h\ 10^m$ to $5^h\ 30^m$ p.m.	Thick atmosphere.	63·0	63·0	0·0
3000		Thin mist.	60·7	60·7	0·0			65·3	65·2	+ 0·1
2000			62·9	62·9	0·0			The balloon then turned to ascend.		
1000			69·8	67·5	+ 2·3					
0			..	75·9	..					
6000	From $5^h\ 30^m$ to $6^h\ 28^m$ p.m.	Very misty	53·5	54·0	− 0·5	From $6^h\ 28^m$ to $7^h\ 22^m$ p.m.	Very misty.	53·0	51·8	+ 1·2
5000			56·8	57·5	− 0·7			54·0	53·6	+ 0·4
4000		Misty.	60·4	60·4	0·0			56·4	56·4	0·0
3000		Faint sun.	65·0	63·9	+ 1·1			58·8	58·8	0·0
2000			..	..	..			61·3	61·8	− 0·5
1000			..	..	..			64·7	64·7	0·0
								The balloon then turned to ascend.		
2000	From $7^h\ 22^m$ to $7^h\ 38^m$ p.m.		66·2	65·6	+ 0·6	From $7^h\ 38^m$ to $8^h\ 0^m$ p.m.		63·3	63·5	− 0·2
1000			66·0	67·5	− 1·5			66·1	66·0	+ 0·1
1000			65·9	65·5	+ 0·4			63·8	64·5	− 0·7
0			..	..	..			68·6	67·9	+ 0·7

THIRTEENTH ASCENT.

Height, in feet, above the mean level of the sea.	Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
July 21.										
3000	From $4^h\ 52^m$ to $5^h\ 4^m$ p.m.	Between two layers of cloud.	53·5	53·7	− 0·2	From $5^h\ 4^m$ to $5^h\ 13^m$ p.m.	Cloud higher.	53·5	53·6	− 0·1
2000		Dense fog.	56·1	56·4	− 0·3		In cloud.	55·3	55·1	+ 0·2
1000		In cloud.	60·0	59·4	+ 0·6			58·0	57·7	+ 0·3
0			61·4	62·5	− 1·1					
3000	From $5^h\ 13^m$ to $5^h\ 19^m$ p.m.	Fog.	54·2	53·7	+ 0·5	From $5^h\ 19^m$ to $5^h\ 28^m$ p.m.	Wetting fog.	52·1	52·5	− 0·4
2000		In cloud.	54·0	54·9	− 0·9		In black cloud.	55·5	55·1	+ 0·4
1000		Fog.	58·0	58·0	0·0		Rain.	59·6	59·6	0·0
1000	From $5^h\ 28^m$ to $5^h\ 33^m$ p.m.	Rain; very dark.	60·0	60·0	0·0	From $5^h\ 33^m$ to $5^h\ 45^m$ p.m.	Very dark, and rain.	60·0	60·0	0·0
0			..	..	..			61·5	61·8	− 0·3

July 11.—The sky was nearly covered with cloud, and the amount of deviation from the adopted temperatures was always small.

July 21.—Heavy rain was falling on the earth during the ascent. The temperature declined almost evenly, and there is no great departure from the adopted curve.

The next Table has been formed by taking the difference between consecutive numbers in the preceding Tables in each ascent.

TABLE IV.—Showing the decrease of Temperature in every 1000 feet of elevation up to 29,000 feet.

Height above the level of the sea.		March 31.		April 18.	June 26.		July 11.							July 21.					Mean.				General Means (omitting July 17, 1862).					
		State of the Sky.																										
		Misty below 3000 ft.	Clear.	Cloudy below 9000 ft.	Cloudy.		Cloudy.							Cloudy.					Cloudy.	Number of experiments.	Clear.	Number of experiments.	Cloudy.			Clear.		
From	To	Ascending.	Descending.	Ascending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Descending.					Mean.	Number of experiments.	Space passed for a decline of 1°.	Mean.	Number of experiments.	Space passed for a decline of 1°.
ft.	ft.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°		°		°		feet.	°		feet.
28000	29000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·8	1	1250
27000	28000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·9	1	1111
26000	27000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·0	1	1000
25000	26000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·0	1	1000
24000	25000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·1	2	911
23000	24000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·3	2	771
22000	23000	1·0	...	...	0·7	1·0	...	...	...	...	...	...	...	...	...	...	...	...	0·8	2	...	...	0·8	2	1250	1·0	4	1000
21000	22000	1·2	0·8	0·3	0·8	0·9	...	...	...	...	...	...	...	...	...	...	...	...	0·8	2	0·8	3	0·8	2	1250	1·1	7	911
20000	21000	1·8	0·7	0·5	0·8	1·5	...	...	...	...	...	...	...	...	...	...	...	...	1·1	2	1·0	3	1·1	2	911	1·2	7	833
19000	20000	1·9	0·4	0·5	0·9	0·8	...	...	...	...	...	...	...	...	...	...	...	...	0·9	2	0·9	3	0·9	2	909	1·3	7	771
18000	19000	2·1	0·8	0·7	1·3	1·5	...	...	...	...	...	...	...	...	...	...	...	...	1·4	2	1·2	3	1·4	2	715	1·5	7	666
17000	18000	1·9	1·0	1·5	1·3	1·3	...	...	...	...	...	...	...	...	...	...	...	...	1·3	2	1·5	3	1·3	2	771	1·7	7	588
16000	17000	2·1	1·5	1·9	1·3	1·0	...	...	...	...	...	...	...	...	...	...	...	...	1·2	2	1·8	3	1·2	2	833	1·9	7	526
15000	16000	2·0	1·7	2·0	1·4	1·2	...	...	...	...	...	...	...	...	...	...	...	...	1·3	2	1·9	3	1·3	2	771	2·0	7	500
14000	15000	2·0	2·2	2·1	1·3	1·0	...	...	...	...	...	...	...	...	...	...	...	...	1·2	2	2·1	3	1·2	2	833	2·1	7	477
13000	14000	2·0	2·0	2·3	1·3	1·2	...	...	...	...	...	...	...	...	...	...	...	...	1·2	2	2·1	3	1·2	2	833	2·2	9	455
12000	13000	2·3	2·1	2·1	1·4	1·2	...	...	...	...	...	...	...	...	...	...	...	...	1·3	2	2·2	3	1·3	2	771	2·4	9	417
11000	12000	2·6	2·0	2·1	1·4	1·2	...	...	...	...	...	...	...	...	...	...	...	...	1·3	2	2·2	3	1·3	2	771	2·5	9	400
10000	11000	2·7	1·9	2·3	1·6	1·2	...	...	...	...	...	...	...	...	...	...	...	...	1·4	2	2·3	3	1·4	2	715	2·5	11	400
9000	10000	2·3	1·6	2·0	1·5	0·9	...	...	...	...	...	...	...	...	...	...	...	...	1·5	3	2·0	3	1·5	2	667	2·5	10	400
8000	9000	2·2	2·0	2·4	2·5	1·1	...	...	...	...	...	...	...	...	...	...	...	...	2·0	3	2·1	2	2·0	2	500	2·5	10	400
7000	8000	2·2	1·8	2·9	2·5	1·8	...	...	...	...	...	...	...	...	...	...	...	...	2·4	3	2·0	2	2·4	2	417	2·5	10	400
6000	7000	2·2	1·7	3·2	3·0	1·6	...	...	...	...	...	...	...	...	...	...	...	...	2·6	3	2·0	2	2·6	3	385	2·6	10	385
5000	6000	2·2	1·5	3·0	4·9	2·8	...	...	3·5	1·8	...	...	...	...	...	...	...	...	3·2	5	1·9	2	3·2	5	313	2·6	12	385
4000	5000	2·3	1·7	4·6	4·0	3·3	...	...	2·9	2·8	...	...	...	...	...	...	...	...	3·5	5	2·0	2	3·3	11	303	2·7	7	374
3000	4000	2·0	1·8	3·7	3·9	4·5	1·6	2·2	3·5	2·4	...	...	...	...	...	...	...	...	3·0	8	1·8	1	3·4	18	294	3·2	8	312
2000	3000	3·0	2·0	3·5	4·2	5·8	2·2	...	...	3·0	...	...	...	2·7	1·5	1·2	2·6	...	3·0	10	2·0	1	3·6	20	278	4·0	7	250
1000	2000	3·0	3·3	3·7	3·8	6·1	4·6	...	...	2·9	1·9	2·5	...	3·0	2·6	3·1	4·5	...	3·4	12	3·3	1	3·8	19	264	5·0	6	200
0	1000	4·9	7·2	3·7	4·2	6·0	8·4	...	...	...	...	...	3·4	3·1	...	...	...	1·8	4·4	8	7·2	1	4·5	15	222	7·2	6	139
No. of Col.		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.

The numbers at the lower elevations are all larger than those at the higher, agreeing in this respect with the results of the experiments of the preceding year, and those with a clear sky are larger than those with a cloudy sky, also agreeing with preceding results.

The numbers in columns 18 and 20 show the mean results from the experiments of this year, the former when the sky was cloudy, and the latter when clear or mostly clear. The numbers in column 19 show the number of experiments upon which each result in column 18 is based; at heights exceeding 5000 feet the experiments were mostly made on one day, viz. June 26, the only day, in fact, on which clouds have reached and enveloped the balloon in different strata and densities, exceeding the height of 4 miles. The numbers in column 21 show the number of experiments with clear skies, and they are but few. The numbers in column 22 show the total number of experiments which have been made at the different heights with a cloudy sky from the beginning of the experiments, and these vary from 11 to 20 up to 5000 feet, and the results must therefore be very nearly true.

The numbers in column 26 show the total number of experiments which have been made at the different heights with clear or nearly clear skies; they vary from 4 to 12 up to the height of 23,000 feet, and there can be but little doubt that the numbers in column 25 are closely approximate to the true numbers up to this elevation; above 24,000 feet, the number of experiments are too few to speak with any confidence.

The numbers in column 22, showing the decrease of temperature for 1000 feet increase of elevation with a cloudy sky, differ very much from those in column 25, showing the decrease for the same space with a clear sky, the former being much smaller up to the height of 18,000 feet; at heights greater than 19,000 feet the differences between the results in the two states of the sky are small.

The numbers in column 24 show the average increase of elevation at every

1000 feet, for a decrease of temperature of 1° with a cloudy sky; from these we see that up to 1000 feet the average space is 222 feet, the space for each 1000 feet increasing till at 20,000 feet it requires fully 1000 feet for a change of 1° of temperature.

In the last column the same results are shown for clear, or nearly clear sky, and they show that a change of 1° takes place for an average increase of 139 feet in the first 1000 feet; this space gradually increasing to fully 1000 feet at heights exceeding 23,000 feet.

By comparing the numbers in columns 24 and 27 together, the different spaces required to be passed through for a decline of 1° of temperature in the two states of the sky will be readily seen: up to 20,000 feet it is generally necessary to pass through a much larger change of elevation for a decline of 1° of temperature than with a clear sky; at heights exceeding 20,000 feet, there does not seem to be much difference in this respect between the two states of the sky.

CLOUDY SKY.

By adding together successively the numbers in column 22, we shall find the whole decrease of temperature from the earth to the different elevations; the results with a cloudy sky are as follows:—

feet	feet		°		feet.
From 0 to	1,000	the decrease was	4·5,	or 1° on the average of	222
„	2,000	„	8·3	„	241
„	3,000	„	11·9	„	253
„	4,000	„	15·3	„	262
„	5,000	„	18·6	„	269
„	6,000	„	21·8	„	275
„	7,000	„	24·4	„	287
„	8,000	„	26·8	„	299
„	9,000	„	28·8	„	313
„	10,000	„	30·3	„	331
„	11,000	„	31·7	„	348
„	12,000	„	33·0	„	365
„	13,000	„	34·3	„	381
„	14,000	„	35·5	„	395
„	15,000	„	36·7	„	409
„	16,000	„	38·0	„	422
„	17,000	„	39·2	„	434
„	18,000	„	40·5	„	445
„	19,000	„	41·9	„	455
„	20,000	„	42·8	„	468
„	21,000	„	43·9	„	479
„	22,000	„	44·7	„	492
„	23,000	„	45·5	„	506

These results, showing the whole decrease of temperature of the air from the earth up to 23,000 feet, differ very considerably from those with a clear sky, to be spoken of presently. The numbers in the last column show the average increment of height for a decline of 1°, as found by using the temperatures of the extremities of the column alone. To 1000 feet high the average is 1° in 222 feet, increasing gradually to 1° in 300 feet at 8000 feet high, and to 506 feet at the height of 23,000 feet.

CLEAR SKY.

By adding together the numbers in column 25 in the same way the following results are found:—

feet	feet		°		feet.
From 0 to	1,000	the decrease was	7·2,	or 1° on the average of	139
„	2,000	„	12·2	„	164
„	3,000	„	16·2	„	186
„	4,000	„	19·4	„	207
„	5,000	„	22·1	„	227
„	6,000	„	24·7	„	243
„	7,000	„	27·3	„	257
„	8,000	„	29·8	„	269
„	9,000	„	32·3	„	278
„	10,000	„	34·8	„	288
„	11,000	„	37·3	„	295
„	12,000	„	39·8	„	302
„	13,000	„	42·2	„	308
„	14,000	„	44·4	„	316
„	15,000	„	46·5	„	323
„	16,000	„	48·5	„	331
„	17,000	„	50·4	„	338
„	18,000	„	52·1	„	346
„	19,000	„	53·6	„	356
„	20,000	„	54·9	„	365
„	21,000	„	56·1	„	375
„	22,000	„	57·2	„	385
„	23,000	„	58·0	„	396
„	24,000	„	59·3	„	406
„	25,000	„	60·4	„	416
„	26,000	„	61·4	„	425
„	27,000	„	62·4	„	434
„	28,000	„	63·3	„	444
„	29,000	„	64·1	„	454
„	30,000	„	64·6	„	464

These results, showing the whole decrease of temperature from the ground to 30,000 feet, differ greatly, as just mentioned, from those with a cloudy sky.

The numbers in the last column, showing the average increase of height for a decline of 1° of temperature from the ground to that elevation, are all smaller than those with a cloudy sky at the same elevation. Each result, up to 22,000 feet, is based upon at least six experiments, taken at different times of the year, and up to this height considerable confidence may be placed in the results; they show that a change takes place in the first 1000 feet of 1° on an average of every 139 feet, increasing to about 300 feet at 11,000 or 12,000 feet; in the experiments taken in the year 1862, this space of 300 feet was at 14,000 feet high, therefore the changes of temperature have been less in 1863 than those in 1862. The latter experiments, however, have been taken at different times of the year from those of the former, and it would seem probable that this element varies with the season of the year. Every experiment proves that the theory of a decline of 1° for every increase of 300 feet must be absolutely put on one side, as without exception the fall of 1° has always taken place in the smallest space when near the earth. To determine this space, and also the law of decrease near the earth, all the observations of temperature of the air up to 5000 feet were laid down on large diagrams, and a line was made to pass through them, giving equal weight to every observation; the result at every 200 feet was then read out, and in this way the next series of Tables were formed.

TABLE V.—Showing the Mean Temperature of the Air at every 200 feet up to 5000 feet.—NINTH ASCENT.

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
March 31.			°	°	°			°	°	°
5000	From $4^h 10^m$ p.m. to $4^h 24^m$ p.m.	Blue sky.	36·0	36·7	− 0·7	From $6^h 14^m$ p.m. to $6^h 38^m$ p.m.	Cloudless.	25·9	26·0	− 0·1
4800			37·0	37·2	− 0·2			26·5	26·4	+ 0·1
4600			37·3	37·6	− 0·3			27·4	26·7	+ 0·7
4400			37·5	38·1	− 0·6			28·0	27·0	+ 1·0
4200			37·6	38·5	− 0·9			28·0	27·4	+ 0·6
4000			38·2	38·9	− 0·7			28·0	27·7	+ 0·3
3800			38·5	39·3	− 0·8			28·1	28·0	+ 0·1
3600			38·0	39·7	− 1·7			28·2	28·4	− 0·2
3400			38·0	40·1	− 2·1			28·4	28·7	− 0·3
3200			38·8	40·5	− 1·7			28·5	29·1	− 0·6
3000			39·6	41·0	− 1·4			29·2	29·5	− 0·3
2800		Misty.	40·5	41·6	− 1·1			29·7	29·7	0·0
2600			41·3	42·2	− 0·9			30·0	30·0	0·0
2400			42·2	42·8	− 0·6			30·0	30·5	− 0·5
2200			43·0	43·4	− 0·4			30·0	31·0	− 1·0
2000			44·0	44·0	0·0			30·0	31·5	− 1·5
1800			44·8	44·5	+ 0·2			30·5	32·0	− 1·5
1600			45·7	45·1	+ 0·6			31·4	32·6	− 1·2
1400			46·3	45·7	+ 0·6			32·0	33·2	− 1·2
1200			46·8	46·4	+ 0·4			32·4	33·9	− 1·5
1000			47·2	47·0	+ 0·2			33·5	34·8	− 1·3
800			47·5	47·6	+ 0·1			36·0	36·0	0·0
600			48·4	48·5	+ 0·1			37·5	37·5	0·0
400			..	49·6	..			39·0	39·0	0·0
200			..	50·7	..			40·5	40·5	0·0
0			..	51·9	..			42·0	42·0	0·0

TENTH ASCENT.

Height, in feet, above the mean level of the sea.	Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
April 18.										
5000	From $1^h 14^m$ p.m. to $1^h 22^m$ p.m.	In cloud or mist.	45·0	45·0	0·0					
4800			45·9	45·8	+ 0·1					
4600			46·6	46·5	+ 0·1					
4400			47·3	47·2	+ 0·1					
4200			47·6	47·9	− 0·3					
4000		Below cloud.	47·9	48·6	− 0·7					
3800			48·5	49·4	− 0·9					
3600			49·0	50·1	− 1·1					
3400			49·8	50·8	− 1·0					
3200			51·0	51·6	− 0·6					
3000			52·3	52·3	0·0					
2800			52·8	53·0	− 0·2					
2600			54·4	53·7	+ 0·7					
2400			55·2	54·4	+ 0·8					
2200			56·3	55·1	+ 1·2					
2000			56·7	55·8	+ 0·9					
1800			56·9	56·5	+ 0·4					
1600			57·3	57·3	0·0					
1400			58·0	58·0	0·0					
1200			58·8	58·8	0·0					
1000			59·5	59·5	0·0					
800			..	60·1						
600			..	60·9						
400			..	61·6						
200			..	62·4						
0			..	63·2						

TABLE V. (*continued.*)

ELEVENTH ASCENT.

Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
June 26.			°	°	°			°	°	°
5000	From $1^h 3^m$ p.m. to $1^h 9^m$ p.m.	..	48·1	47·9	+ 0·2	From $2^h 23^m$ p.m. to $2^h 28^m$ p.m.	Very misty and thick.	41·5	41·0	+ 0·5
4800		..	48·8	48·7	+ 0·1			42·0	41·5	+ 0·5
4600		..	49·5	49·5	0·0			42·5	42·2	+ 0·3
4400		..	50·3	50·3	0·0			43·2	42·8	+ 0·4
4200		..	51·1	51·1	0·0			44·0	43·5	+ 0·5
4000		..	51·9	51·9	0·0			44·6	44·3	+ 0·3
3800		..	52·7	52·7	0·0			45·4	45·7	+ 0·3
3600		..	53·5	53·5	0·0			46·0	45·8	+ 0·2
3400		..	54·2	54·2	0·0			46·8	46·7	+ 0·1
3200		..	55·0	55·0	0·0			47·5	47·7	− 0·2
3000		..	55·8	55·8	0·0			48·8	48·8	0·0
2800		..	56·6	56·6	0·0			49·9	49·9	0·0
2600		..	57·6	57·5	+ 0·1			51·0	51·0	0·0
2400		..	58·6	58·4	+ 0·2			52·2	52·2	0·0
2200		..	59·7	59·2	+ 0·5			53·4	53·4	0·0
2000		Very dark.	60·7	60·0	+ 0·7			54·6	54·6	0·0
1800			61·7	60·9	+ 0·8			55·9	55·9	0·0
1600			62·5	61·7	+ 0·8			57·1	57·1	0·0
1400			62·7	62·4	+ 0·3			58·3	58·3	0·0
1200			63·6	63·1	+ 0·5			59·5	59·5	0·0
1000			64·7	63·8	+ 0·9			60·7	60·7	0·0
800			..	64·6	..			61·8	61·8	0·0
600			..	65·4	..			63·1	63·1	0·0
400			..	66·2	..			64·3	64·3	0·0
200			..	67·1	..			65·5	65·5	0·0
0			..	68·0	..			66·7	66·7	0·0

TWELFTH ASCENT.

Height, in feet, above the mean level of the sea.	Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
July 11.										
4600	From $4^h 53^m$ p.m. to $5^h 7^m$ p.m.	Atmosphere thick and misty.	60·0	59·8	+ 0·2	From $5^h 7^m$ p.m. to $5^h 34^m$ p.m.	Atmosphere thick and misty.	60·0	61·8	− 1·8
4400			58·7	59·0	− 0·3			61·5	62·1	− 0·6
4200			59·7	59·0	+ 0·7			62·0	62·5	− 0·5
4000			61·0	59·1	+ 1·9			63·0	63·0	0·0
3800		Thin mist.	57·9	59·3	− 1·4			64·0	63·5	+ 0·5
3600			59·1	59·6	− 0·5			64·9	64·0	+ 0·9
3400			59·8	60·0	− 0·2			65·2	64·4	+ 0·8
3200			60·3	60·3	0·0			65·7	64·8	+ 0·9
3000			60·7	60·7	0·0			65·3	65·2	+ 0·1
2800			61·0	61·0	0·0		Sun seen faintly.	65·0	65·6	− 0·6
2600			61·4	61·4	0·0			65·0	66·0	− 1·0
2400			61·8	61·8	0·0			65·7	66·5	− 0·8
2200			62·3	62·3	0·0			The bal	loon th	en
2000			62·9	62·9	0·0			turned	to asce	nd.
1800			63·8	63·8	0·0					
1600			64·7	64·7	0·0					
1400			65·5	65·5	0·0					
1200			66·4	66·4	0·0					
1000			69·8	67·5	+ 2·3					
800			69·0	68·8	+ 0·2					
600			70·4	70·4	0·0					
400			72·2	72·2	0·0					
200			74·0	74·0	0·0					
0			..	75·9						

TABLE V. (*continued.*)

TWELFTH ASCENT (*continued*).

Height, in feet, above the mean level of the sea.	Temperature of the Air.									
	Ascending.					Descending.				
	Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
July 11.			°	°	°			°	°	°
5000	From 5h 34m p.m. to 6h 13m p.m.	Very misty.	56·8	57·5	−0·7	From 7h 1m 30s p.m. to 7h 22m p.m.	Very misty.	54·0	53·6	+0·4
4800			57·7	57·8	−0·1			54·2	54·0	+0·2
4600		Misty.	58·6	58·3	+0·3			54·6	54·6	0·0
4400			59·0	59·0	0·0		...	55·2	55·2	0·0
4200			59·7	59·7	0·0		...	55·8	55·8	0·0
4000			60·4	60·4	0·0		...	56·4	56·4	0·0
3800			60·6	61·1	−0·5		...	57·0	57·0	0·0
3600			62·0	61·8	+0·2		...	57·6	57·6	0·0
3400			63·9	62·5	+1·4		...	58·0	58·0	0·0
3200		Sun seen faintly.	64·5	63·2	+1·3		...	58·3	58·3	0·0
3000			65·0	63·9	+1·1		...	58·8	58·8	0·0
2800			65·1	64·6	+0·5		...	59·5	59·5	0·0
2600			65·5	65·4	+0·1		...	60·1	60·1	0·0
2400			65·1	66·2	−1·1		...	60·7	60·7	0·0
2200		...	...	...	...		...	61·0	60·3	+0·7
2000		...	...	...	...		...	61·3	61·8	−0·5
1800		...	...	...	...		...	62·3	62·3	0·0
1600		...	...	...	...		...	62·9	62·9	0·0
1400		...	...	...	...		...	63·5	63·5	0·0
1200		...	...	...	...		...	64·1	64·1	0·0
1000		...	...	...	...		...	64·7	64·7	0·0
								The balloon then turned to ascend.		
2600	From 7h 26m 30s p.m. to 7h 37m 30s p.m.	...	64·4	64·8	−0·4	From 7h 37m 30s p.m. to 7h 59m 45s p.m.				
2400		...	65·5	65·0	+0·5		...	63·0	63·0	0·0
2200		...	66·0	65·3	+0·7		...	63·0	63·0	0·0
2000		...	66·2	65·6	+0·6		...	63·0	63·2	−0·2
1800		...	66·7	65·9	+0·8		...	63·3	63·5	−0·2
1600		...	66·8	66·3	+0·5		...	63·7	63·8	−0·1
1400		...	66·5	66·7	−0·2		...	64·1	64·1	0·0
1200		...	66·9	67·1	−0·2		...	64·5	64·5	0·0
1000		...	66·0	67·5	−1·5		...	65·5	65·5	0·0
800		...	...	...	...		...	66·1	66·0	+0·1
							...	...	...	...
								The balloon then turned to ascend.		
1600	From 7h 59m 45s p.m. to 8h 25m 30s p.m.	...	64·5	64·5	0·0	From 8h 25m 30s p.m. to 8h 50m p.m.				
1400		...	64·7	64·7	0·0		...	64·2	63·8	+0·4
1200		...	65·0	65·0	0·0		...	64·3	64·0	+0·3
1000		...	65·9	65·5	+0·4		...	64·3	64·2	+0·1
800		...	65·1	66·0	−0·9		...	63·8	64·5	−0·7
600		...	...	...	...		...	64·8	64·9	−0·1
400		...	...	...	...		...	65·3	65·4	−0·1
200		...	...	...	...		...	66·2	66·0	+0·2
0		...	...	...	...		...	67·5	66·8	+0·7
		...	...	...	...		...	68·6	67·9	+0·7

TABLE V. (*continued.*)

THIRTEENTH ASCENT.

Height, in feet, above the mean level of the sea.	Temperature of the Air.									
	Ascending.					Descending.				
	Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
July 21.			°	°	°			°	°	°
3000	From 4h 52m p.m. to 5h 3m p.m.	Out of cloud.	53·5	53·7	−0·2	From 5h 3m p.m. to 5h 11m p.m.		53·5	53·6	−0·1
2800		In dense fog.	54·0	54·0	0·0		In open space.	53·5	53·6	−0·1
2600			54·0	54·4	−0·4			53·5	53·8	−0·3
2400		In dry cloud.	54·7	55·1	−0·4			54·0	54·2	−0·2
2200			55·6	55·7	−0·1			54·5	54·6	−0·1
2000			56·1	56·3	−0·2		In cloud.	55·3	55·1	+0·2
1800			56·6	57·0	−0·4			55·7	55·6	+0·1
1600		In cloud, clouds very light.	57·8	57·6	+0·2			56·0	56·0	0·0
1400			58·2	58·3	−0·1			56·1	56·5	−0·4
1200			59·2	59·0	+0·2			56·8	57·0	−0·2
1000		Entered clouds.	60·0	59·5	+0·5			58·0	57·7	+0·3
800			60·3	60·1	+0·2			The balloon then turned to ascend.		
600			60·5	60·6	−0·1					
400			60·8	61·2	−0·4					
200			61·0	61·6	−0·6					
0		Sky overcast.	61·4	62·1	−0·7					
3400	From 5h 11m to 5h 20m 30s p.m.		53·1	...	...	From 5h 20m 30s to 5h 32m p.m.				
3200		Fog.	53·0	53·5	−0·5		Wetting fog.	52·4	52·2	+0·2
3000			54·2	53·7	+0·5			52·1	52·5	−0·4
2800			55·0	54·0	+1·0			52·3	52·8	−0·5
2600			54·2	54·2	0·0			53·0	53·3	−0·3
2400			54·2	54·4	−0·2			53·8	53·8	0·0
2200			54·1	54·6	−0·5		Black cloud.	54·9	54·4	+0·5
2000		Cloud.	54·0	54·9	−0·9			55·5	55·1	+0·4
1800			54·9	55·4	−0·5			56·0	55·9	+0·1
1600			56·0	56·0	0·0			56·6	56·6	0·0
1400		Fog.	57·0	56·5	+0·5			57·2	57·4	−0·2
1200			57·5	57·1	+0·4		Rain.	58·1	58·5	−0·4
1000			58·0	58·0	0·0			59·6	59·6	0·0
800			...	...	...			61·8	61·8	0·0
600			...	...	...			61·5	63·0	−1·5
								The balloon then turned to ascend.		
1800	From 5h 32m p.m. to 5h 35m p.m.		57·2	57·2	0·0	From 5h 35m p.m. to 5h 45m p.m.		58·1	58·1	0·0
1600			57·5	57·5	0·0			59·0	58·5	+0·5
1400			58·2	58·2	0·0		Very dark cloud.	58·7	58·9	−0·2
1200		Rain. Very dark.	59·0	59·0	0·0			59·4	59·4	0·0
1000			60·0	59·9	+0·1			60·0	60·0	0·0
800			61·0	60·8	+0·2			61·5	60·6	+0·9
600			61·5	61·8	−0·3			61·5	61·1	+0·4
400			...	...	...			61·5	61·6	−0·1
200			...	...	...		Rain.	61·5	62·1	−0·6
0			...	..	...			61·5	62·7	−1·2

Table VI.—Showing the Decrease of Temperature with every Increase of Height of 100 feet up to 5000 feet.

Height above the level of the sea. From	To	March 31. Misty. Ascending.	March 31. Clear. Descending.	April 18. Cloudy. Ascending.	June 26. Cloudy. Ascending.	June 26. Cloudy. Descending.	July 11. Misty. Ascending.	July 11. Misty. Descending.	July 11. Misty. Ascending.	July 11. Misty. Descending.	July 11. Misty. Ascending.	July 11. Misty. Descending.	July 11. Misty. Ascending.	July 11. Misty. Descending.	July 11. Misty. Ascending.	July 11. Misty. Descending.	July 21. Overcast. Ascending.	July 21. Overcast. Descending.	July 21. Overcast. Ascending.	July 21. Overcast. Descending.	Mean. Cloudy.	Number of experiments.	Clear.	Number of experiments.	Cloudy. Mean.	Cloudy. Number of experiments.	Cloudy. Space passed through for a decline of 1°.	Clear. Mean.	Clear. Number of experiments.	Clear. Space passed through for a decline of 1°.
feet.	feet.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°		°		°		feet.	°		feet.
4900	5000	0·2	0·2	0·4	0·4	0·3	..	..	0·1	0·2	..	..	..	..	..	..	..	..	..	..	0·3	5	0·2	2	0·3	15	334	0·3	5	334
4800	4900	0·3	0·2	0·4	0·4	0·3	..	..	0·2	0·2	..	..	..	..	..	..	..	..	..	..	0·3	5	0·2	2	0·3	15	334	0·3	5	334
4700	4800	0·2	0·1	0·4	0·4	0·3	..	..	0·2	0·3	..	..	..	..	..	..	..	..	..	..	0·3	5	0·2	2	0·3	14	334	0·3	5	334
4600	4700	0·2	0·2	0·4	0·4	0·3	..	..	0·3	0·3	..	..	..	..	..	..	..	..	..	..	0·3	5	0·2	2	0·3	14	334	0·3	5	334
4500	4600	0·2	0·1	0·4	0·4	0·3	..	0·1	0·3	0·3	..	..	..	..	..	..	..	..	..	..	0·3	5	0·2	2	0·3	15	334	0·3	5	334
4400	4500	0·3	0·2	0·4	0·4	0·3	..	0·2	0·4	0·3	..	..	..	..	..	..	..	..	..	..	0·3	6	0·2	2	0·3	15	334	0·3	5	334
4300	4400	0·2	0·2	0·4	0·4	0·3	..	0·2	0·3	0·3	..	..	..	..	..	..	..	..	..	..	0·3	6	0·2	2	0·3	18	334	0·3	5	334
4200	4300	0·2	0·2	0·4	0·4	0·4	..	0·2	0·4	0·3	..	..	..	..	..	..	..	..	..	..	0·3	6	0·2	2	0·3	18	334	0·3	5	334
4100	4200	0·2	0·1	0·4	0·4	0·4	..	0·2	0·3	0·3	..	..	..	..	..	..	..	..	..	..	0·3	6	0·2	2	0·3	18	334	0·3	7	334
4000	4100	0·2	0·2	0·4	0·4	0·4	0·1	0·3	0·4	0·3	..	..	..	..	..	..	..	..	..	..	0·3	7	0·2	2	0·3	19	334	0·3	7	334
3900	4000	0·2	0·1	0·4	0·4	0·4	0·1	0·2	0·3	0·3	..	..	..	..	..	..	..	..	..	..	0·3	7	0·2	2	0·3	19	334	0·3	7	334
3800	3900	0·2	0·2	0·4	0·4	0·4	0·1	0·3	0·4	0·3	..	..	..	..	..	..	..	..	..	..	0·3	7	0·2	2	0·3	19	334	0·3	7	334
3700	3800	0·2	0·2	0·4	0·4	0·3	0·1	0·2	0·3	0·3	..	..	..	..	..	..	..	..	..	..	0·3	8	0·2	1	0·3	20	334	0·3	6	334
3600	3700	0·2	0·2	0·4	0·4	0·4	0·2	0·3	0·4	0·3	..	..	..	..	..	..	..	..	..	..	0·3	8	0·2	1	0·3	20	334	0·3	6	334
3500	3600	0·2	0·1	0·4	0·3	0·4	0·2	0·2	0·3	0·3	..	..	..	..	..	..	..	..	..	..	0·3	8	0·1	1	0·3	20	334	0·3	6	334
3400	3500	0·2	0·2	0·3	0·4	0·5	0·2	0·2	0·4	0·3	..	..	..	..	..	..	..	..	..	..	0·3	8	0·2	1	0·3	20	334	0·3	6	334
3300	3400	0·2	0·2	0·4	0·4	0·5	0·1	0·2	0·3	0·3	..	..	..	..	..	..	..	..	..	..	0·3	8	0·2	1	0·3	20	334	0·3	6	334
3200	3300	0·2	0·2	0·4	0·4	0·5	0·2	0·2	0·4	0·3	..	..	..	..	..	..	..	..	..	..	0·3	8	0·2	1	0·3	20	334	0·3	6	334
3100	3200	0·2	0·2	0·4	0·4	0·5	0·2	0·2	0·3	0·3	..	..	..	..	..	..	0·1	0·1	..	..	0·3	10	0·2	1	0·3	22	334	0·3	6	334
3000	3100	0·3	0·2	0·4	0·4	0·6	0·2	0·2	0·4	0·4	..	..	..	..	..	..	0·1	0·2	..	..	0·3	10	0·2	1	0·4	21	251	0·3	6	334
2900	3000	0·3	0·1	0·4	0·4	0·5	0·1	0·2	0·3	0·3	..	..	..	..	0·2	..	0·1	0·1	..	..	0·3	10	0·1	1	0·4	22	251	0·3	6	334
2800	2900	0·3	0·1	0·4	0·4	0·6	0·2	0·2	0·4	0·3	..	..	..	..	0·3	..	0·2	0·2	..	..	0·3	11	0·1	1	0·4	22	251	0·3	6	334
2700	2800	0·3	0·1	0·4	0·4	0·5	0·2	0·2	0·4	0·3	..	..	..	..	0·3	0·1	0·1	0·2	..	..	0·3	12	0·1	1	0·4	23	251	0·3	6	334
2600	2700	0·3	0·2	0·5	0·5	0·6	0·2	0·2	0·4	0·3	..	..	..	..	0·3	0·1	0·1	0·3	..	..	0·3	12	0·2	1	0·4	23	251	0·3	6	334
2500	2600	0·3	0·2	0·4	0·4	0·6	0·2	0·2	0·4	0·3	0·1	..	..	..	0·3	0·2	0·1	0·2	..	..	0·3	13	0·2	1	0·4	24	251	0·3	6	334
2400	2500	0·3	0·3	0·5	0·5	0·6	0·2	0·3	0·4	0·3	0·1	..	..	..	0·3	0·2	0·1	0·3	..	..	0·3	13	0·3	1	0·4	24	251	0·3	6	334
2300	2400	0·3	0·2	0·4	0·4	0·6	0·2	..	..	0·2	0·1	0·1	..	..	0·2	0·2	0·1	0·3	..	..	0·3	12	0·2	1	0·4	23	251	0·3	6	334
2200	2300	0·3	0·3	0·4	0·4	0·6	0·3	..	..	0·3	0·2	0·1	..	..	0·3	0·2	0·1	0·3	..	..	0·3	12	0·3	1	0·4	23	251	0·3	6	334
2100	2200	0·3	0·2	0·4	0·4	0·6	0·3	..	..	0·2	0·1	0·1	..	..	0·2	0·2	0·1	0·3	..	..	0·3	12	0·2	1	0·4	23	251	0·3	6	334
2000	2100	0·3	0·3	0·4	0·4	0·6	0·3	..	..	0·3	0·2	0·2	..	..	0·3	0·3	0·2	0·4	..	..	0·3	12	0·3	1	0·4	23	251	0·3	6	334
1900	2000	0·3	0·2	0·4	0·4	0·6	0·4	..	..	0·3	0·1	0·1	..	..	0·3	0·2	0·2	0·4	..	..	0·3	12	0·2	1	0·4	23	251	0·3	6	334
1800	1900	0·2	0·3	0·5	0·5	0·7	0·5	..	..	0·3	0·2	0·2	..	..	0·3	0·3	0·3	0·4	..	..	0·3	12	0·3	1	0·4	23	251	0·3	6	334
1700	1800	0·3	0·3	0·4	0·4	0·6	0·4	..	..	0·3	0·2	0·1	..	..	0·3	0·2	0·3	0·3	0·1	0·2	0·3	14	0·3	1	0·4	25	251	0·3	6	334
1600	1700	0·3	0·3	0·4	0·4	0·6	0·5	..	..	0·3	0·2	0·2	..	..	0·3	0·2	0·3	0·4	0·2	0·2	0·3	14	0·3	1	0·4	25	251	0·3	6	334
1500	1600	0·3	0·3	0·4	0·3	0·6	0·4	..	..	0·3	0·2	0·2	0·1	0·1	0·3	0·2	0·2	0·4	0·3	0·2	0·3	16	0·3	1	0·4	27	251	0·4	7	251
1400	1500	0·3	0·3	0·3	0·4	0·6	0·4	..	..	0·3	0·2	0·2	0·1	0·1	0·4	0·3	0·3	0·4	0·4	0·2	0·3	16	0·3	1	0·4	27	251	0·4	7	251
1300	1400	0·3	0·3	0·3	0·3	0·6	0·4	..	..	0·3	0·2	0·2	0·1	0·1	0·3	0·2	0·3	0·5	0·4	0·2	0·3	16	0·3	1	0·4	25	251	0·4	5	251
1200	1300	0·4	0·4	0·4	0·4	0·6	0·5	..	..	0·3	0·2	0·3	0·2	0·1	0·3	0·3	0·3	0·6	0·4	0·3	0·3	16	0·4	1	0·4	25	251	0·5	5	201
1100	1200	0·3	0·4	0·3	0·3	0·6	0·5	..	..	0·3	0·2	0·2	0·2	0·1	0·3	0·3	0·4	0·5	0·4	0·3	0·3	16	0·4	1	0·4	25	251	0·5	5	201
1000	1100	0·3	0·5	0·4	0·4	0·6	0·6	..	..	0·3	0·2	0·3	0·3	0·2	0·3	0·4	0·5	0·6	0·5	0·3	0·4	16	0·5	1	0·4	25	251	0·5	5	201
900	1000	0·3	0·6	0·4	0·4	0·5	0·6	..	..	..	..	0·2	0·2	0·2	0·3	..	..	0·6	0·4	0·3	0·4	12	0·6	1	0·4	21	251	0·5	5	201
800	900	0·3	0·6	0·4	0·4	0·6	0·7	..	..	..	..	0·3	0·3	0·2	0·3	..	..	0·6	0·5	0·3	0·4	12	0·6	1	0·4	19	251	0·6	5	167
700	800	0·4	0·7	0·4	0·4	0·6	0·8	..	..	..	..	..	..	0·2	0·3	..	..	0·6	0·5	0·2	0·4	10	0·7	1	0·4	19	251	0·6	5	167
600	700	0·5	0·8	0·4	0·4	0·7	0·8	..	..	..	..	..	..	0·3	0·3	..	..	0·6	0·5	0·3	0·5	10	0·8	1	0·4	19	251	0·6	5	167
500	600	0·5	0·7	0·4	0·4	0·6	0·8	..	..	..	..	..	..	0·3	0·3	..	..	..	..	0·2	0·5	8	0·7	1	0·5	17	201	0·6	5	167
400	500	0·6	0·8	0·4	0·4	0·6	0·9	..	..	..	..	..	..	0·3	0·3	..	..	..	..	0·3	0·5	8	0·8	1	0·5	17	201	0·6	5	167
300	400	0·5	0·7	0·4	0·4	0·6	0·9	..	..	..	..	..	..	0·4	0·3	..	..	..	..	0·2	0·5	8	0·7	1	0·5	17	201	0·6	5	167
200	300	0·6	0·8	0·4	0·4	0·6	1·0	..	..	..	..	..	..	0·4	0·3	..	..	..	..	0·3	0·5	8	0·8	1	0·5	17	201	0·7	5	143
100	200	0·6	0·7	0·4	0·4	0·6	0·9	..	..	..	..	..	..	0·5	0·3	..	..	..	..	0·3	0·5	8	0·7	1	0·5	17	201	0·7	5	143
0	100	0·6	0·8	0·5	0·5	0·6	1·0	..	..	..	..	..	..	0·6	0·4	..	..	..	..	0·3	0·6	8	0·8	1	0·6	17	167	0·8	5	125
No. of column		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.

The largest numbers are those at the bottom of the column, and the smallest at the top, or at the highest elevations. The numbers in column 20 show the mean with the cloudy skies, and those in 22 the results with clear or partially clear skies, but there was only one such instance in the year 1863. The numbers in column 24 show the general mean from all the experiments with cloudy skies, as based upon experiments varying in number from 14 to 27; and in column 26 the space in feet for a decline of 1° is shown, being 167 feet near the earth, increasing gradually to 334 feet at heights exceeding 3000 feet. In column 29 the results for clear or partially clear skies are shown, being 125 feet for 1° near the earth, increasing gradually to 334 feet at 1700 feet, above which it is nearly constant up to 5000 feet.

From these results we may conclude that in a cloudy state of the sky the decline of temperature is less in amount and more nearly uniform up to the clouds, than in a clear sky, and that the greatest change in both states of the sky is near the earth.

§ 6. VARIATION OF THE HYGROMETRIC CONDITION OF THE AIR WITH ELEVATION.

All the adopted readings of the temperature of the dew-point in Section 4 were laid down on diagrams, and their points joined. As it was evident then to the eye that the changes did not follow a regular decrease in the temperature of the air, the numbers at every 1000 feet were read from the diagram, and in this way the next Tables were formed.

TABLE VII.—*Showing the Variation of the Hygrometric condition of the Air at every 1000 feet of Height.*

NINTH ASCENT.

Height, in feet, above the mean level of the sea.	Humidity of the Air.									
	Ascending.					Descending.				
	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
March 31.										
23000	From 4h 10m p.m. to 5h 27m p.m.	Clear blue sky.	Unknown, but certainly less than −40°.	Unknown, but certainly less than ·006.	Unknown, but certainly less than 7.	From 5h 27m p.m. to 6h 30m p.m.	Cloudless.	Unknown, but certainly less than −40°.	Unknown, but certainly less than ·006.	Unknown, but certainly less than 7.
22000										
21000										
20000										
19000										
18000										
17000										
			°	in.				°	in.	
16000			...	...	...					
15000			...	...	...			−29·0	·010	19
14000			...	...	...			−26·0	·012	24
13000			...	...	...			−23·0	·014	24
12000			−36·0	·007	7			−19·0	·017	23
11000			−26·0	·012	10			−16·0	·020	25
10000			−16·5	·020	14			−14·5	·022	25
9000			− 4·0	·036	23			−13·8	·022	23
8000			5·5	·055	32			−12·5	·024	23
7000			9·5	·066	35			−12·0	·024	21
6000			12·0	·074	35			− 9·5	·028	23
5000			20·0	·108	53			0·0	·044	33
4000		Misty.	22·0	·118	51			3·0	·050	36
3000			28·0	·153	62			8·0	·062	45
2000			28·5	·156	54			15·0	·086	53
1000			34·0	·196	60			19·8	·108	61
420			38·2	·231	67			21·0	·113	61

March 31.—At the earth's surface the dew-point was 38°; it decreased to 28½° at 2000 feet, and continued almost at this value to 3500 feet; at 4000 feet it fell suddenly to 22°, and again suddenly at 5000 feet; after this it declined much more rapidly than the temperature of the air; and the air at 10,000 feet high became very dry, and exceedingly so at heights exceeding 15,000 feet.

On descending, the temperature of the dew-point was very much below that of the air to the height of 6000 feet, and afterwards it approached that of the air rather quickly.

In ascending, the air was moist while passing through mist between 1000 and 3000 feet high, and the degree of humidity varied from 54 to 62; another moist stratum was situated between 4000 and 5000 feet; above this the amount of water diminished very quickly, the degree of humidity at 12,000 feet being 7 only, and *at points higher than this it was much less. On descending, the declining curve was interrupted at 4500 feet, at 3000 feet, and at 1500 feet by narrow bands of different degrees of humidity.*

TABLE VII. (*continued.*)

TENTH ASCENT.

Height, in feet, above the mean level of the sea.	Humidity of the Air.				
	Ascending.				
	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
April 18.			°	in.	
17000	From 1h 14m p.m. to 2h 30m p.m.	Above cloud.	−20·0	·017	23
16000			−16·0	·020	23
15000			−12·0	·024	22
14000			− 7·0	·031	28
13000			− 2·0	·040	33
12000			2·0	·048	37
11000			6·0	·057	32
10000		In cloud or mist.	10·5	·069	38
9000			17·0	·094	52
8000			25·0	·135	73
7000			32·0	·181	87
6000			33·8	·194	76
5000			34·0	·196	67
4000		Below cloud.	35·0	·204	61
3000			40·0	·247	64
2000			45·5	·305	68
1000			49·0	·348	69
420			50·2	·364	68

April 18.—The temperature of the dew-point was 50° on the ground, the air was misty; *at 1000 feet high, and again at 2200 feet, moist strata of air were passed, the difference between the temperatures of the air and dew-point becoming less in both cases; these two temperatures then separated till* the height of 4000 feet was reached, when the air again became more moist, and at 7000 feet high the temperature of the air was only 2° above that of the dew-point; at this time the mist almost amounted to a fog. The degree of humidity was 87; on passing above this, the temperature of the dew-point rapidly and almost evenly declined, and at heights exceeding 17,000 feet the air became very dry.

TABLE VII. (*continued.*)—ELEVENTH ASCENT.

Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
June 26.			°	in.				°	in.	
23000	From 1h 3m p.m. to 1h 55m p.m.	Clouds still above; faint blue sky.	− 2·0	·040	40	From 1h 55m p.m. to 2h 28m p.m.	Clouds above.	9·5		
22000		In fog.	− 2·3	·040	34			2·0		
21000			− 18·5	·018	18		Fog.	− 4·5	·036	26
20000			− 15·5	·021	19			5·0	·054	38
19000		In fog; cirri above.	− 17·5	·019	15		Faint sun.	3·0	·050	32
18000		Just above cloud; faint blue sky; clouds on our level.	9·0	·065	34			3·0	·050	32
17000		Cold dry thin fog.	18·0	·098	49			10·5	·069	46
16000		In fog.	20·5	·110	68		Rain.	15·5	·088	49
15000		In dry fog.	24·5	·132	78			14·5	·084	45
14000		In fog.	31·0	·174	100		Snow.	22·0	·118	63
13000			30·5	·170	100			24·0	·129	69
12000		Sun seen faintly.	28·0	·153	91			23·0	·123	65
11000		In fog; thin rai	22·0	·118	68			20·0	·108	58
10000			16·0	·090	46		Very murky and thick atmosphere.	12·0	·074	59
9000			11·0	·071	35			15·0	·086	44
8000			10·5	·069	57			15·5	·088	44
7000			15·0	·086	34			18·5	·100	43
6000			24·5	·132	48			22·5	·120	54
5000			34·0	·196	69			26·0	·141	53
4000			41·0	·257	67			34·0	·196	68
3000			45·0	·299	68			39·5	·242	72
2000			45·0	·299	57			43·5	·283	68
1000		Very dark.	48·0	·335	55			48·0	·335	65
300			50·0	·361	56			...	...	...
0			...	...	...			55·0	·433	66

June 26.—The temperature of the dew-point was 50°, and on leaving the earth it declined less rapidly than the temperature, so that the humidity increased; after passing above 4000 feet the dew-point declined rather quickly to 6000 feet, where its rapid decline was checked, but continued to decline to 8000 feet; it was here as low as 10½°; it was 11° at 9000 feet, and then increased, momentarily approaching that of the air; and at 12,700 feet, having passed through rain at 10,000 feet, these two temperatures were alike, and the air was saturated with moisture, and continued thus to 14,200 feet high; it then separated, and whilst passing through a dry fog at 15,000 feet, whilst the air was increasing in temperature, the dew-point decreased; on passing out of cloud at 18,000 feet the air became dry, and from 20,000 feet to 23,000 feet the dew-point was from 30° to 40° below that of air; at this time rain-clouds were at the same height, and at 23,000 feet the air again was so moist, that the difference between these two temperatures was 6° only. The degree

of humidity varied very much, from 100 at 13,000 and 14,000 feet to 19 at 20,000 feet and to 40 at 23,000 feet.

On descending, the temperature of the dew-point separated from that of the air, and was 30° less at 21,000 feet; on passing then into fog, the moisture increased so rapidly that at 19,800 feet there was only 6° difference between these temperatures; it again separated, and again approached whilst passing through rain and snow; on passing below the snow at 10,000 feet, the air at first became drier, but afterwards the increase of the temperature of the dew-point was more rapid than that of the air, and the air became more humid. Both the temperature of the air and the distribution of the water in this ascent were very remarkable.

TABLE VII. (*continued.*)—TWELFTH ASCENT.

Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
July 11.			°	in.				°	in.	
4600	From 4h 53m p.m. to 5h 7m p.m.	Atmosphere thick and misty.	50·3	·365	75	From 5h 7m p.m. to 5h 34m p.m.	Atmosphere thick and misty.	50·3	·365	75
4400			49·8	·358	72			49·5	·355	65
4200			48·0	·335	65			49·2	·351	63
4000			47·8	·333	62			47·0	·323	56
3800		Thin mist.	44·6	·295	62			49·2	·351	59
3600			43·3	·280	56			50·0	·361	59
3400			43·5	·283	65			51·0	·374	62
3200			43·5	·283	54			51·0	·374	59
3000			43·4	·281	53			50·9	·373	60
2800			43·2	·279	52		Sun seen faintly.	50·7	·370	60
2600			43·5	·283	52			50·5	·367	60
2400			43·2	·279	55			50·2	·364	69
2200			43·0	·277	49			The balloon then turned to ascend.		
2000			43·0	·277	48					
1800			46·0	·311	52					
1600			50·0	·361	60					
1400			50·2	·364	59					
1200			48·5	·342	54					
1000			47·0	·323	44					
800			47·5	·329	47					
600			48·6	·343	46					
400			50·0	·361	46					
200			51·1	·375	45					
0			52·2	·391	44					

July 11.—The balloon first rose to 4600 feet, the degree of humidity increasing with elevation; it then descended to 2600 feet, and the temperature of the dew-point was nearly constant. The balloon then turned to ascend, and reached a height of 6600 feet; the humidity increased as before to 5400 feet, and then became somewhat less humid; on descending, the air at first increased in humidity, and then decreased, being driest at the lowest part of the descent, viz. 1000 feet. The balloon then turned to ascend for a third time and reached 2600 feet, with a somewhat drier atmosphere than had been met with at this elevation on this day; at this time the track of the balloon was near the sea; on descending to 800 feet the air was more humid; and this was found to be the case by ascending for the fourth time to 1600 feet, and again confirmed on finally descending to the height of 800 feet, when the instruments were packed up.

TABLE VII. (*continued.*)

TWELFTH ASCENT (*continued*).

Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
July 11.			°	in.				°	in.	
6600	From 5h 34m p.m. to 6h 28m p.m.		40·0	·247	68	From 6h 28m p.m. to 7h 25m 30s p.m.				
6400		Misty.	41·3	·260	63		Very misty.	41·0	·257	64
6200		Cirrus & cirro-stratus clouds far above.	42·5	·272	63			41·8	·265	70
6000			43·1	·278	68		...	41·3	·260	65
5800			46·3	·315	70		...	42·2	·269	67
5600			48·0	·335	73		...	41·7	·264	72
5400			50·4	·394	85		...	42·0	·267	69
5200			49·0	·348	75		...	43·0	·277	70
5000		Very misty.	49·4	·353	76		...	44·2	·288	70
4800			48·5	·342	72		...	45·7	·307	73
4600			49·2	·351	71		...	47·0	·323	77
4400			46·7	·319	65		...	48·0	·335	78
4200		Misty.	46·5	·317	61		...	47·2	·325	75
4000			47·0	·323	62		...	46·6	·318	71
3800			47·9	·334	63		...	46·0	·311	68
3600			49·7	·357	64		...	45·5	·305	65
3400			49·8	·358	63		...	45·0	·299	63
3200			49·6	·356	59		...	44·0	·288	60
3000		Faint sun.	49·0	·348	56		...	43·2	·279	57
2800			50·5	·367	59		...	42·5	·272	55
2600			49·0	·348	55		...	42·3	·270	64
2400			49·6	·356	58		...	42·6	·273	53
2200			...	...	...		...	42·8	·275	53
2000		...	...	...	...		...	43·0	·277	52
1800		...	...	...	...		...	43·0	·277	51
1600		...	...	...	...		...	43·1	·278	51
1400		...	...	...	...		...	44·1	·289	50
1200		...	...	...	...		...	46·0	·311	52
1000		...	...	...	...		...	47·0	·323	53
0							...	47·7	·331	53
								The balloon then turned to ascend.		
2600	From 7h 25m 30s p.m. to 7h 37m 30s p.m.	...	44·5	·294	49	From 7h 37m 30s p.m. to 8h p.m.	...	45·2	·302	52
2400		...	42·0	·267	43		...	47·0	·323	56
2200		...	40·9	·256	41		...	45·6	·306	53
2000		...	41·8	·265	41		...	44·5	·294	55
1800		...	43·3	·280	43		...	44·5	·294	50
1600		...	43·5	·283	43		...	46·3	·315	53
1400		...	43·8	·286	49		...	48·0	·335	55
1200		...	45·8	·308	46		...	49·3	·352	57
1000		...	48·6	·343	45		...	50·9	·373	59
800		...	...	...	...		...	51·1	·375	60
								The balloon then turned to ascend.		
1600	From 8h 1m p.m. to 8h 11m 30s p.m.	...	49·0	·348	58	From 8h 11m 30s p.m. to 8h 20m p.m.	...	48·6	·343	57
1400		...	49·0	·348	57		...	49·5	·355	59
1200		...	50·2	·364	59		...	50·0	·361	60
1000		...	50·0	·361	55		...	50·6	·369	62
800		...	50·7	·370	60		...	51·0	·374	61

TABLE VII. (*continued.*)

THIRTEENTH ASCENT.

Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
July 21.			°	in.				°	in.	
3000	From 4h 52m p.m. to 5h 3m p.m.	Out of cloud.	52·5	·396	97	From 5h 3m p.m. to 5h 11m p.m.		52·5	·396	97
2800		In dense fog.	54·0	·418	100			51·0	·374	91
2600			54·0	·418	100		In open space.	53·0	·403	98
2400		In dry cloud.	54·7	·428	100			53·0	·403	96
2200			55·6	·443	100		In cloud	53·0	·403	95
2000		In clouds; clouds very light.	55·4	·439	97			53·3	·407	93
1800			54·6	·427	93			52·5	·396	89
1600			55·2	·436	91			54·0	·418	93
1400			56·2	·453	93			55·1	·434	96
1200		Entered clouds.	57·0	·465	93			56·0	·449	97
1000			57·0	·465	90			The balloon then turned to ascend.		
800			57·4	·472	91					
600			58·0	·482	91					
400			59·0	·500	94					
200		Sky overcast.	60·2	·522	94					
0			60·5	·528	96					
3200	From 5h 11m p.m. to 5h 20m 30s p.m.		52·8	·400	99	From 5h 20m 30s p.m. to 5h 32m p.m.		51·0	·374	85
3000		Fog.	52·7	·399	95		Wetting fog.	52·1	·389	100
2800			53·0	·403	93			52·2	·391	99
2600			53·0	·403	96			52·5	·396	98
2400			53·6	·412	100			52·9	·401	97
2200			53·9	·416	99			53·5	·410	95
2000		Cloud.	54·0	·418	100		Black cloud.	53·0	·403	91
1800			54·9	·431	100			53·2	·406	94
1600			56·0	·449	100			54·5	·425	93
1400			57·0	·465	100			56·0	·449	96
1200		Fog.	57·5	·473	100			57·6	·475	98
1000			58·0	·482	100		Rain.	59·5	·509	99
800			...	...	...			61·8	·552	100
600			...	...	...			61·5	·546	100
								The balloon then turned to ascend.		
1800	From 5h 32m p.m. to 5h 35m 45s p.m.		57·0	·465	99	From 5h 35m 45s p.m. to 5h 37m 45s p.m.		58·1	·483	100
1600			57·5	·473	100			59·0	·500	100
1400			58·2	·485	100		Very dark cloud.	58·6	·492	100
1200		Rain; very dark.	59·0	·500	100			59·4	·507	100
1000			60·0	·518	100		Rain.	60·0	·518	100
800			61·0	·537	100					
600			61·5	·546	100					

July 21.—Rain was falling heavily on leaving the earth; the degree of humidity at first decreased, and then increased and decreased again, till on passing into dense fog at 2200 feet the air was saturated. On descending to 1400 feet the air was nearly saturated; on rising a second time the air was again saturated, and was nearly so up to 3200 feet; on the second descent the humidity varied from 91 to 100, and afterwards the air was quite saturated from 1800 feet to the earth. Rain had been falling heavily all the time the balloon was in the air.

Table VIII.—Showing the Degree of Humidity at every 1000 feet up to 24,000 feet.

Height above the level of the sea.	March 31.		April 18.	June 26.		July 11.								July 21.						Mean.			
	State of the Sky.																						
	Misty below 3000 ft.	Clear.	Cloudy below 9000 ft.	Cloudy.		Cloudy.								Cloudy.									
	Descending.	Ascending.	Ascending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Cloudy.	Number of experiments.	Clear.	Number of experiments.
feet.																							
24000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23000	...	...	...	40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	40	1	...	...
22000	...	...	...	34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	34	1	...	...
21000	...	...	...	18	26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	22	2	...	...
20000	...	...	...	19	38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	29	2	...	...
19000	...	...	...	15	32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	24	2	...	...
18000	...	...	...	34	32	...	...	...	...	...	...	...	...	...	...	...	...	...	...	33	2	...	...
17000	...	...	23	49	46	...	...	...	...	...	...	...	...	...	...	...	...	...	...	47	2	23	1
16000	...	19	23	68	49	...	...	...	...	...	...	...	...	...	...	...	...	...	...	59	2	21	2
15000	...	24	22	78	45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	62	2	23	2
14000	...	24	28	100	63	...	...	...	...	...	...	...	...	...	...	...	...	...	...	81	2	26	2
13000	...	23	33	100	69	...	...	...	...	...	...	...	...	...	...	...	...	...	...	84	2	28	2
12000	7	25	37	91	65	...	...	...	...	...	...	...	...	...	...	...	...	...	...	78	2	23	3
11000	10	25	32	68	58	...	...	...	...	...	...	...	...	...	...	...	...	...	...	63	2	22	3
10000	14	23	38	46	59	...	...	...	...	...	...	...	...	...	...	...	...	...	...	53	2	25	3
9000	23	23	52	35	44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	44	3	23	2
8000	32	21	73	57	44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	58	3	27	2
7000	35	23	87	34	43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	55	3	29	2
6000	35	33	76	48	54	...	...	68	67	...	...	...	...	...	...	...	...	...	...	63	5	34	2
5000	53	36	67	69	53	...	...	76	73	...	...	...	...	...	...	...	...	...	...	67	5	44	2
4000	51	45	61	67	68	62	56	62	68	...	...	...	...	...	...	...	...	...	...	63	7	48	2
3000	62	53	64	68	72	53	60	56	55	...	...	...	...	97	97	95	100	...	...	73	12	53	1
2000	54	61	68	57	68	48	...	...	51	41	55	...	...	97	93	100	91	...	...	69	12	61	1
1000	60	61	69	55	65	44	...	...	53	55	59	55	62	90	...	100	99	100	100	71	15	61	1
0	67	...	69	56	66	44	...	...	...	...	...	...	...	96	...	...	...	...	97	71	7	...	...

The numbers in this Table show, as in the previous experiments, that the moisture in the air at the same elevation is very different at different times; the numbers in the last column of the Table show the average results in the two states of clear and cloudy skies, with the number of experiments upon which each result is based. By combining those with cloudy sky with those previously obtained, according to the number of observations upon which each result was based, the following results were obtained.

With an overcast sky, the degree of humidity on the earth was	74	from 12	experiments.
At 1000 feet	73	,, 23	,,
2000 ,, ...	73	,, 23	,,
3000 ,, ...	76	,, 24	,,
4000 ,, ...	73	,, 17	,,
5000 ,, ...	75	,, 10	,,
6000 ,, ...	70	,, 8	,,
7000 ,, ...	58	,, 5	,,
8000 ,, ...	54	,, 5	,,
9000 ,, ...	46	,, 5	,,
10,000 ,, ...	51	,, 4	,,
11,000 ,, ...	53	,, 4	,,
12,000 ,, ...	55	,, 4	,,
13,000 ,, ...	53	,, 4	,,
14,000 ,, ...	48	,, 4	,,
15,000 ,, ...	62	,, 2	,,
16,000 ,, ...	59	,, 2	,,
17,000 ,, ...	47	,, 2	,,
18,000 ,, ...	33	,, 2	,,
19,000 ,, ...	24	,, 2	,,
20,000 ,, ...	29	,, 2	,,
21,000 ,, ...	22	,, 2	,,
22,000 ,, ...	34	,, 1	,,
23,000 ,, ...	40	,, 1	,,

The law of moisture here indicated is an almost uniform state of humidity to the height of 5000 or 6000 feet, that is, to the usual height of the cloud plane; then a sudden decrease and continued decrease to 14,000 feet. At elevations exceeding 14,000 feet with cloudy skies the number of experiments are too few to speak with confidence of the results; the humidity, however, seems generally to decrease; the high numbers at 15,000 and 16,000 feet are probably accidental.

By treating the results with a clear or a nearly clear sky in the same way, the following results were obtained.

With a clear sky, the degree of humidity was

On the ground	63	from 4 experiments.
At 1000 feet	67	,, 6 ,,
2000 ,,	70	,, 6 ,,
3000 ,,	72	,, 6 ,,
4000 ,,	70	,, 9 ,,
5000 ,,	63	,, 8 ,,
6000 ,,	59	,, 8 ,,
7000 ,,	56	,, 9 ,,
8000 ,,	51	,, 9 ,,
9000 ,,	45	,, 7 ,,
10,000 ,,	42	,, 8 ,,
11,000 ,,	41	,, 8 ,,
12,000 ,,	35	,, 6 ,,
13,000 ,,	40	,, 5 ,,
14,000 ,,	36	,, 5 ,,
15,000 ,,	44	,, 5 ,,
16,000 ,,	40	,, 5 ,,
17,000 ,,	39	,, 4 ,,
18,000 ,,	21	,, 2 ,,
19,000 ,,	36	,, 2 ,,
20,000 ,,	33	,, 1 ,,
21,000 ,,	32	,, 1 ,,
22,000 ,,	21	,, 1 ,,
23,000 ,,	16	,, 1 ,,

The law of moisture here shown is a steady increase of humidity from the ground to the height of 3000 or 4000 feet, then a decrease by 5000 feet to the same as on the ground, declining afterwards, but not regularly, to the height of 23,000 feet; above this point the air is very dry, but, so far as I have seen, never quite free from water.

By comparing the results with a cloudy sky with those from a clear sky, the degree of humidity on the ground with the latter is less by 11 than with the former, but approximate very closely together at the height of 3000 feet; the air continues humid with the cloudy sky to 5000 or 6000 feet, but becomes less humid with a clear sky at 4000 feet, and declines, but less rapidly than with cloudy sky, till at 7000 feet they are again near together, and continue so to 9000 feet; the humidity then increases with the cloudy sky to the height of 15,000 feet, where the air is as humid as at the height of 7000 feet; whilst with the clear sky the humidity decreases to the height of 13,000 feet, but then increases to 15,000 feet, where the air is as humid as it was at 10,000 feet. It is remarkable that this humid state is in both states of the sky at the same elevation; at elevations greater than this, the humidity decreases in both states of the sky, but more rapidly at first with the cloudy than with the clear state, till at heights exceeding 20,000 feet there is but little difference in the results from the two states.

§ 7. Comparison of the Temperature of the Dew-point, as determined by different Instruments.

Table IX.—Showing the Temperature of the Dew-point, as determined at about the same height by different instruments and methods, and comparison of the results together.

Under 1000 feet.

Date.				Height.	Dew-point temperatures. Calculated from: Dry and Wet (free).	Calculated from: Dry and Wet (aspirated).	Observed by: Daniell's Hygrometer.	Observed by: Regnault's Hygrometer.	Temperature of the dew-point as determined by Dry and Wet (free) above that by: Dry and Wet (aspirated).	Daniell's Hygrometer.	Regnault's Hygrometer.
	d	h	m	feet.	°	°	°	°	°	°	°
March	31	4	7	350	38·3	..	38·0	..	..	+ 0·3	
		4	11	350	38·3	..	..	36·2	..	..	+ 2·1
June	26	1	6¼	....	45·9	..	..	48·9	..	..	− 3·0
July	11	4	44	....	52·7	..	55·0	..	..	− 2·3	
		4	45	....	52·8	..	53·5	..	..	− 0·7	
		4	47	....	52·2	..	55·0	..	..	− 2·8	
		4	51	....	51·4	..	54·0	..	..	− 2·6	
		8	1	760	50·9	..	51·0	..	..	− 0·1	
	21			....	59·0	..	..	59·5	..	..	− 0·5
		5	29½	948	61·1	..	..	61·5	..	..	− 0·4

Between 1000 and 2000 feet.

Date.	d	h	m	Height.	Dry and Wet (free).	Dry and Wet (aspirated).	Daniell's Hygrometer.	Regnault's Hygrometer.	Dry and Wet (aspirated).	Daniell's Hygrometer.	Regnault's Hygrometer.
March	31	4	18	1515	29·2	..	..	30·0	..	..	− 0·8
July	11	7	13½	1876	42·4	..	44·0	..	..	− 1·6	
		7	15	1876	43·0	..	43·5	..	..	− 0·5	
		7	16½	1776	42·7	..	43·0	..	..	− 0·3	
		7	19	1582	44·4	..	44·5	..	..	− 0·1	
		7	20	1485	45·2	..	45·2	..	..	0·0	
		7	22	1290	46·4	..	45·5	..	..	+ 0·9	
		7	26½	1029	48·0	..	48·5	..	..	− 0·5	
		7	27¼	1119	46·6	..	48·0	..	..	− 1·4	
		7	28¼	1341	44·4	..	45·0	..	..	− 0·6	
		7	30	1231	45·1	..	44·5	..	..	+ 0·6	
		7	32	1096	45·5	..	45·0	..	..	+ 0·5	
		7	33	1488	43·0	..	42·5	..	..	+ 0·5	
		7	46	1580	45·8	..	47·0	..	..	− 1·2	
		7	47	1483	47·0	..	47·5	..	..	− 0·5	
		7	49	1483	49·4	..	48·0	..	..	+ 1·4	
		7	50	1337	49·2	..	48·5	..	..	+ 0·7	
		7	52½	1145	49·0	..	49·0	..	..	0·0	
		7	55	1000	50·0	..	50·0	..	..	0·0	
		7	56¾	1020	50·7	..	50·5	..	..	+ 0·2	
		7	57¼	1029	49·9	..	50·8	..	..	− 0·9	
		8	4	1290	50·0	..	51·5	..	..	− 1·5	
	21	5	15½	1241	57·5	..	58·0	..	..	− 0·5	

TABLE IX. (*continued.*)

Between 2000 and 3000 feet.

Date.				Height.	Dew-point temperatures.				Temperatures of the dew-point as determined by Dry and Wet (free) above that by		
					Calculated from		Observed by				
	d	h	m	feet.	Dry and Wet (free).	Dry and Wet (aspirated).	Daniell's Hygrometer.	Regnault's Hygrometer.	Dry and Wet (aspirated).	Daniell's Hygrometer.	Regnault's Hygrometer.
					°	°	°	°	°	°	
June	26	1	7	2651	45·7	..	47·0	..	..	− 1·3	
July	11	5	34	2470	50·3	..	50·8	..	..	− 0·5	
		5	37	2469	49·9	..	50·5	..	..	− 0·6	
		5	40	2424	47·9	..	52·0	..	..	− 4·1	
		5	42	2470	47·0	..	50·5	..	..	− 3·5	
		5	43½	2488	48·3	..	50·9	..	..	− 2·6	
		5	45	2488	48·5	..	49·5	..	..	− 1·0	
		5	48	2817	50·4	..	50·0	..	..	+ 0·4	
		5	49	2820	50·9	..	50·0	..	..	+ 0·9	
		5	50	2820	51·6	..	50·5	..	..	+ 1·1	
		5	52	2707	51·6	..	51·0	..	..	+ 0·6	
		5	53	2926	49·0	..	50·0	..	..	− 1·0	
		7	12	2199	44·0	..	44·5	..	..	− 0·5	
		7	35	2426	41·8	..	42·0	..	..	− 0·2	
		7	36	2555	42·2	..	42·5	..	..	− 0·3	
		7	38	2657	44·6	..	43·5	..	..	+ 1·1	
		7	38½	2597	44·6	..	44·0	..	..	+ 0·6	
July	21	4	58	2790	54·2	..	54·5	..	..	− 0·3	
		5	1	2610	55·0	..	55·0	..	..	0·0	
		5	2	2850	54·2	..	54·0	..	..	+ 0·2	
		5	3	2900	53·1	..	53·0	..	..	+ 0·1	
		5	5	2890	50·7	..	52·0	..	..	− 1·3	
		5	23¼	2870	52·2	..	52·0	..	..	+ 0·2	

Between 3000 and 4000 feet.

July	11	5	4	3930	45·8	..	46·0	..	..	− 0·2	
		5	14	3860	47·9	..	49·0	..	..	− 1·1	
		5	15	....	47·9	..	50·2	..	..	− 2·3	
		5	24	3524	50·4	..	50·0	..	..	+ 0·4	
		5	29½	....	50·4	..	51·5	..	..	− 1·1	
		5	53½	3046	49·0	..	50·0	..	..	− 1·0	
		5	56	3529	49·8	..	50·0	..	..	− 0·2	
		6	1	....	50·2	..	50·0	..	..	+ 0·2	
		6	3	3250	50·3	..	50·0	..	..	+ 0·3	
		6	4	3250	49·8	..	51·0	..	..	− 1·2	
		6	5½	3720	48·1	..	50·3	..	..	− 2·2	
		7	6½	3855	45·5	..	46·4	..	..	− 0·9	
		7	8	3277	42·9	..	46·0	..	..	− 3·1	
		7	9½	3068	42·5	..	45·5	..	..	− 3·0	
	21	5	20½	3298	51·8	..	51·5	..	..	+ 0·3	

TABLE IX. (*continued.*)

Between 4000 and 5000 feet.

Date.				Height.	Dew-point temperatures.				Temperatures of the dew-point as determined by Dry and Wet (free) above that by		
					Calculated from		Observed by				
	d	h	m	feet.	Dry and Wet (free).	Dry and Wet (aspirated).	Daniell's Hygrometer.	Regnault's Hygrometer.	Dry and Wet (aspirated).	Daniell's Hygrometer.	Regnault's Hygrometer.
					°	°	°	°	°	°	
July	11	5	5½	4030	46·8	..	46·5	..	..	+ 0·3	
		5	7	4366	49·7	..	51·5	..	..	− 1·8	
		5	7½	4610	50·3	..	48·5	..	..	+ 1·8	
		5	16	4171	49·0	..	49·2	..	..	− 0·2	
		6	9	4610	47·0	..	49·0	..	..	− 2·0	
		6	12	4905	49·5	..	49·2	..	..	+ 0·3	
		7	3	4706	47·4	..	47·3	..	..	+ 0·1	
		7	4	4380	47·2	..	46·7	..	..	+ 0·5	

Between 5000 and 6000 feet.

March	31	6	11½	5901	0·0	..	0·0	..	..	0·0	
July	11	6	13	5105	49·5	..	50·0	..	..	− 0·5	
		6	14	5271	47·8	..	49·0	..	..	− 1·2	
		6	15	5327	48·6	..	49·0	..	..	− 0·4	
		6	16	5382	51·2	..	49·5	..	..	+ 1·7	
		6	18	5684	47·2	..	48·0	..	..	− 0·8	
		6	20	5772	46·6	..	47·1	..	..	− 0·5	
		6	21	5828	46·4	..	47·0	..	..	− 0·6	
		6	22	5884	45·5	..	46·5	..	..	− 1·0	
		6	58	5975	41·6	..	41·0	..	..	+ 0·6	
		6	59	5523	42·0	..	41·5	..	..	+ 0·5	
		7	1½	5150	44·4	..	48·0	..	..	− 3·6	

Between 6000 and 7000 feet.

July	11	6	24	6451	40·9	..	42·5	..	..	− 1·6	
		6	27	6623	38·6	..	42·0	..	..	− 3·4	
		6	32	6186	41·2	..	41·5	..	..	− 0·3	
		6	34	6186	41·0	..	41·5	..	..	− 0·5	
		6	35	6210	41·0	..	40·8	..	..	+ 0·2	
		6	47	6031	43·4	..	42·0	..	..	+ 1·4	
		6	47½	....	42·5	..	41·8	..	..	+ 0·7	
		6	48	6309	43·0	..	41·5	..	..	+ 1·5	
		6	50	6420	42·4	..	41·5	..	..	+ 0·9	
		6	52	6453	39·6	..	40·4	..	..	− 0·8	
		6	53	6475	40·7	..	40·0	..	..	+ 0·7	
		6	54½	6530	41·7	..	40·5	..	..	+ 1·2	
		6	55	6588	41·7	..	40·5	..	..	+ 1·2	
		6	55½	6588	41·7	..	41·5	..	..	+ 0·2	
		6	56	6530	40·5	..	40·0	..	..	+ 0·5	

TABLE IX. (*continued.*)

Between 7000 and 8000 feet.

Date.	Height.	Dew-point temperatures: Calculated from Dry and Wet (free).	Dew-point temperatures: Calculated from Dry and Wet (aspirated).	Dew-point temperatures: Observed by Daniell's Hygrometer.	Dew-point temperatures: Observed by Regnault's Hygrometer.	Temperatures of the dew-point as determined by Dry and Wet (free) above that by Dry and Wet (aspirated).	Temperatures of the dew-point as determined by Dry and Wet (free) above that by Daniell's Hygrometer.	Temperatures of the dew-point as determined by Dry and Wet (free) above that by Regnault's Hygrometer.
d h m	feet.	°	°	°	°	°	°	°
March 31 4 27½	7035	9·3						
6 8	7907	11·8	..	10·0	..	..	+ 1·8	

Between 8000 and 9000 feet.

Date.	Height.	Calc. Dry and Wet (free).	Calc. Dry and Wet (aspirated).	Obs. Daniell's Hygrometer.	Obs. Regnault's Hygrometer.	Above: Dry and Wet (aspirated).	Above: Daniell's Hygrometer.	Above: Regnault's Hygrometer.
June 26 1 15	....	..	..	11·0				

Between 10,000 and 11,000 feet.

Date.	Height.	Calc. Dry and Wet (free).	Calc. Dry and Wet (aspirated).	Obs. Daniell's Hygrometer.	Obs. Regnault's Hygrometer.	Above: Dry and Wet (aspirated).	Above: Daniell's Hygrometer.	Above: Regnault's Hygrometer.
March 31 4 35	10047	−16·9						

Between 14,000 and 15,000 feet.

Date.	Height.	Calc. Dry and Wet (free).	Calc. Dry and Wet (aspirated).	Obs. Daniell's Hygrometer.	Obs. Regnault's Hygrometer.	Above: Dry and Wet (aspirated).	Above: Daniell's Hygrometer.	Above: Regnault's Hygrometer.
March 31 5 56	14325	− 4·6	..	−10·0	..	..	+ 5·4	
June 26 1 23	14530	22·1	..	20·0	..	..	+ 2·1	

Between 15,000 and 16,000 feet.

Date.	Height.	Calc. Dry and Wet (free).	Calc. Dry and Wet (aspirated).	Obs. Daniell's Hygrometer.	Obs. Regnault's Hygrometer.	Above: Dry and Wet (aspirated).	Above: Daniell's Hygrometer.	Above: Regnault's Hygrometer.
March 31 5 52	15630	−28·1						
June 26 1 26	15935	15·2	..	..	17·2	..	− 2·0	

Between 16,000 and 17,000 feet.

Date.	Height.	Calc. Dry and Wet (free).	Calc. Dry and Wet (aspirated).	Obs. Daniell's Hygrometer.	Obs. Regnault's Hygrometer.	Above: Dry and Wet (aspirated).	Above: Daniell's Hygrometer.	Above: Regnault's Hygrometer.
March 31 5 46	16080	− 7·4						
June 26 1 27	16079	13·4	..	17·0	..	..	− 3·6	
1 29⅓	....	19·5	..	..	21·0	..	..	− 1·5
1 29¾	....	22·0	..	..	24·2	..	..	− 2·2
1 30	....	21·5	..	..	23·5	..	..	− 2·0

Between 18,000 and 19,000 feet.

Date.	Height.	Calc. Dry and Wet (free).	Calc. Dry and Wet (aspirated).	Obs. Daniell's Hygrometer.	Obs. Regnault's Hygrometer.	Above: Dry and Wet (aspirated).	Above: Daniell's Hygrometer.	Above: Regnault's Hygrometer.
June 26 1 35½	18053	3·3	..	9·0				
1 36¾	18555	− 5·0	..	..	− 9·2	..	..	+ 4·2
1 37	....	−14·1	..	..	− 5·0	..	..	− 9·1
1 38	....	−17·4	..	− 4·8	− 4·2	..	..	−13·2

TABLE IX. (*continued.*)

Between 19,000 and 20,000 feet.

Date.	Height.	Dew-point temperatures: Calculated from Dry and Wet (free).	Dew-point temperatures: Calculated from Dry and Wet (aspirated).	Dew-point temperatures: Observed by Daniell's Hygrometer.	Dew-point temperatures: Observed by Regnault's Hygrometer.	Temperatures of the dew-point as determined by Dry and Wet (free) above that by Dry and Wet (aspirated).	Temperatures of the dew-point as determined by Dry and Wet (free) above that by Daniell's Hygrometer.	Temperatures of the dew-point as determined by Dry and Wet (free) above that by Regnault's Hygrometer.
d h m	feet.	°	°	°	°	°	°	°
June 26 1 41·10	19544	−12·5	..	..	− 9·5	..	..	− 3·0
1 42	....	−19·0	..	..	− 9·0	..	..	−10·0
1 43½	....	− 5·9	..	..	−13·0	..	..	+ 7·1
2 5	19901	15·8	..	18·0	..	..	− 2·2	
2 12½	....	12·6	..	..	15·0	..	..	− 2·4

Between 20,000 and 21,000 feet.

Date.	Height.	Calc. Dry and Wet (free).	Calc. Dry and Wet (aspirated).	Obs. Daniell's Hygrometer.	Obs. Regnault's Hygrometer.	Above: Dry and Wet (aspirated).	Above: Daniell's Hygrometer.	Above: Regnault's Hygrometer.
June 26 1 44	20648	−12·5	..	..	−13·0	..	..	+ 0·5

Between 21,000 and 22,000 feet.

Date.	Height.	Calc. Dry and Wet (free).	Calc. Dry and Wet (aspirated).	Obs. Daniell's Hygrometer.	Obs. Regnault's Hygrometer.	Above: Dry and Wet (aspirated).	Above: Daniell's Hygrometer.	Above: Regnault's Hygrometer.
June 26 1 46	21266	−22·8	..	..	−13·0	..	..	− 9·8

Between 22,000 and 23,000 feet.

Date.	Height.	Calc. Dry and Wet (free).	Calc. Dry and Wet (aspirated).	Obs. Daniell's Hygrometer.	Obs. Regnault's Hygrometer.	Above: Dry and Wet (aspirated).	Above: Daniell's Hygrometer.	Above: Regnault's Hygrometer.
March 31 5 27	22884	−35·4						
June 26 1 55	22965	..	10·7	..	+ 2·5			

Between 23,000 and 24,000 feet.

Date.	Height.	Calc. Dry and Wet (free).	Calc. Dry and Wet (aspirated).	Obs. Daniell's Hygrometer.	Obs. Regnault's Hygrometer.	Above: Dry and Wet (aspirated).	Above: Daniell's Hygrometer.	Above: Regnault's Hygrometer.
June 26 1 54½	....	2·5	..	..	+ 3·0	..	..	− 0·5
1 54⅔	23143	..	+ 1·8	+ 1·5	..			

TABLE X.

Heights between			Excess of Temperature of the Dew-point as found by Dry and Wet Thermometers (free) above that found by			
			Daniell's Hygrometer.	No. of obs.	Regnault's Hygrometer.	No. of obs.
feet.		feet.	°		°	
0	to	1000	−1·4	6	−0·5	4
1000	,,	2000	−0·2	22	−0·8	1
2000	,,	3000	−0·5	23		
3000	,,	4000	−1·1	15		
4000	,,	5000	−0·1	8		
5000	,,	6000	−0·5	12		
6000	,,	7000	+0·1	15		
7000	,,	8000	+1·8	1		
8000	,,	9000				
9000	,,	10000				
10000	,,	11000				
11000	,,	12000				
12000	,,	13000				
13000	,,	14000				
14000	,,	15000	+2·8	2		
15000	,,	16000	−2·0	1		
16000	,,	17000	−3·6	1	−1·9	3
17000	,,	18000				
18000	,,	19000				
19000	,,	20000	−2·2	1	−2·1	4
20000	,,	21000	....	..	+0·5	1
21000	,,	22000	....	..	−9·8	1
22000	,,	23000				
23000	,,	24000	....	..	+0·5	1

In all the experiments there seems to be no certain difference in the temperature of the dew-point as determined by Daniell's and Regnault's hygrometers, and no certain difference in the results as found by the dry- and wet-bulb free and those by the dry- and wet-bulb aspirated. The most important comparison therefore now to be made is the comparison of results by dry- and wet-bulb thermometers and with one or the other of the hygrometers.

The following are the results as found from all the simultaneous determinations of the temperature of the dew-point by Daniell's hygrometer and the dry- and wet-bulb thermometers (free).

The temperature of the dew-point by the dry- and wet-bulb (free) up to 1000 feet was the same as by Daniell's hygrometer, from 14 expts.
From 1000 to 2000 feet was 0·1 lower than by ,, from 29 ,,
2000 to 3000 feet was 0·1 lower than by ,, from 44 ,,
3000 to 4000 feet was 0·1 higher than by ,, from 50 ,,
4000 to 5000 feet was 0·4 lower than by ,, from 30 ,,
5000 to 6000 feet was 0·9 lower than by ,, from 28 ,,
6000 to 7000 feet was 0·3 lower than by ,, from 26 ,,
7000 to 8000 feet was 3·5 higher than by ,, from 2 ,,
8000 to 9000 feet there have been no determinations.
9000 to 10,000 feet was 0·8 lower than by ,, from 1 expt.

At heights exceeding 10,000 feet there have not been sufficient determinations to deduce any satisfactory results, but up to 7000 feet there have been sufficient to speak confidently, and the result is that the dew-point, as found by the dry- and wet-bulb thermometers, is worthy of every confidence; for the differences, as shown above, are quite within the error of observation.

HEIGHTS AND APPEARANCES OF THE CLOUDS, AND APPEARANCES OF THE SKY.

March 31.

There were detached cumuli before starting; blue sky.

At $4^{h}\ 21^{m}\ 30^{s}$ p.m., at 3698 feet. Very misty; a few beautiful cumuli.

At $4^{h}\ 27^{m}$ p.m., at 6251 feet. Earth appears dotted with cumuli clouds; blue lines of light crossing each other at right angles.

At $4^{h}\ 52^{m}$ p.m., at 17,400 feet. Horizon not visible; a mass of clouds to the N.W. so distinct that its boundary-line can be traced.

April 18.

At $1^{h}\ 19^{m}$ p.m., at 2575 feet. Misty.

At $1^{h}\ 21^{m}\ 10^{s}$ p.m., at 4392 feet. Cumuli on the same level as the balloon; misty.

At $1^{h}\ 25^{m}\ 30^{s}$ p.m., at 7180 feet. Thick mist; almost a fog.

At $1^{h}\ 30^{m}$ p.m., at 11,055 feet. Above the clouds; sea of clouds below.

June 26.

From $1^{h}\ 17^{m}\ 45^{s}$ p.m., at 11,204 feet, to $1^{h}\ 25^{m}$ p.m., at 15,598 feet. In fog.

At $1^{h}\ 32^{m}\ 30^{s}$ p.m., at 17,144 feet. Clouds above us.

At $1^{h}\ 34^{m}$ p.m., at 17,479 feet. In cloud.

At $1^{h}\ 36^{m}$ p.m., at 18,291 feet. In a wetting fog.

At $1^{h}\ 37^{m}$ p.m., at 18,560 feet. Cold dry thin fog.

At $1^{h}\ 39^{m}$ p.m., at 19,018 feet. Just above cloud; cirri far above, clouds all round on the same level as the balloon.

At $1^{h}\ 41^{m}\ 45^{s}$ p.m., at 19,909 feet. Evidently three layers of clouds.

At $1^{h}\ 43^{m}$ p.m., at 20,648 feet. Rain-cloud on our right; two nimbus clouds near us and on our level.

From $1^{h}\ 43^{m}\ 30^{s}$ p.m., at 20,648 feet, to $1^{h}\ 46^{m}$, at 21,266 feet. In fog.

At $1^{h}\ 50^{m}$ p.m., at 22,053 feet. We looked round at the faint blue sky covered with cirri, and estimated its height to be many miles; the atmosphere thick and misty.

At $1^{h}\ 54^{m}$ p.m., at 22,664 feet. Cirri clouds above; sky faint blue.

At $1^{h}\ 54^{m}\ 40^{s}$ p.m., at 23,143 feet. Above the clouds, but not free from mist; the clouds present no fine views, few peaks, and all is confused and dirty-looking. The blue sky is of the same paleness as seen from the earth.

At $1^{h}\ 5^{m}$ p.m., at 22,168 feet. The sky is faint blue, and the clouds are all below.

At $2^{h}\ 2^{m}$ p.m., at 20,167 feet. The sun seen faintly.

At $2^{h}\ 2^{m}\ 45^{s}$ p.m., at 20,167 feet. In fog.

From $2^{h}\ 4^{m}\ 30^{s}$ p.m., at 19,367 feet, to $2^{h}\ 5^{m}$, at 19,901 feet. In fog.

At $2^{h}\ 6^{m}$ p.m., at 19,963 feet. Faint gleams of light.

At $2^{h}\ 6^{m}\ 20^{s}$ p.m., at 20,025 feet. Fog above and below, none near us; faint gleam of light.

At $2^{h}\ 7^{m}\ 30^{s}$ p.m., at 20,025 feet. Drops of water falling from the balloon on my note-book.

From $2^h\ 8^m\ 30^s$ p.m., at 19,089 feet, to $2^h\ 14^m$, at 14,892 feet. In fog; at the latter time it was becoming thin, but nothing could be seen.

At $2^h\ 14^m\ 30^s$ p.m., at 14,501 feet. Thin rain was pattering on the balloon, and moving against us.

At $2^h\ 14^m\ 45^s$ p.m., at 14,197 feet. Snow-storm met with.

At $2^h\ 15^m$ p.m., at 13,380 feet. Snow falling; there were spiculæ and cross spiculæ; many snow crystals, small but distinct, all icy particles; dark everywhere.

At $2^h\ 15^m\ 30^s$ p.m., at 12,433 feet. Dense snow all around, no flakes; all icy particles and crystals; the appearance was beautiful.

At $2^h\ 15^m\ 45^s$ p.m., at 11,923 feet. When sand was thrown out the snow appeared to go up.

At $2^h\ 16^m$ p.m., at 11,412 feet. Sand presents a golden appearance when mixing with the snow.

At $2^h\ 17^m$ p.m., at 10,508 feet. No snow.

At $2^h\ 18^m$ p.m., at 10,011 feet. Lower atmosphere very murky indeed.

At $2^h\ 19^m$ p.m., at 10,011 feet. The lower atmosphere presents a brownish, yellowish tinge, remarkably dull.

At $2^h\ 20^m\ 30^s$ p.m., at 8107 feet. Lower atmosphere is very remarkable. Mr. Coxwell has never seen it so when far from a town.

July 11.

From $5^h\ 14^m$ p.m., at 3860 feet, to $5^h\ 29^m\ 30^s$ p.m., at 3642 feet. The atmosphere was thick and misty.

At $5^h\ 52^m\ 30^s$ p.m., at 2762 feet. Misty.

From $6^h\ 5^m$ p.m., at 3529 feet, to $6^h\ 14^m$ p.m., at 5271 feet. Misty.

At $6^h\ 22^m$ p.m., at 5884 feet. Cirrus and cirrostratus clouds far above.

At $6^h\ 31^m$ p.m., at 6328 feet. Very thick.

At $6^h\ 55^m\ 30^s$ p.m., at 6588 feet. Misty.

July 21.

The sky was overcast before starting.

At $4^h\ 52^m\ 30^s$ p.m., at 859 feet. Clouds were entered.

At $4^h\ 54^m$ p.m., at 1681 feet. Clouds very light.

At $4^h\ 55^m\ 30^s$ p.m., at 2351 feet. In dry cloud.

At $4^h\ 55^m\ 40^s$ p.m., at 2470 feet. In white cloud.

At $4^h\ 58^m\ 30^s$ p.m., at 2589 feet. In dense fog.

At $5^h\ 2^m\ 15^s$ p.m., at 2875 feet. The clouds above are darker than those below; the white edges of the lower clouds are visible.

At $5^h\ 7^m$ p.m., at 2642 feet. Lower clouds are moving in a north-easterly direction, with greater speed than the balloon.

At $5^h\ 8^m\ 15^s$ p.m., at 2290 feet. In cloud.

At $5^h\ 9^m$ p.m., at 2020 feet. Detached clouds below are moving in an opposite direction to that in which we were formerly moving.

At $5^h\ 10^m$ p.m., at 1727 feet. Scud below moving very fast.

At $5^h\ 16^m$ p.m., at 1890 feet. In cloud.

At $5^h\ 19^m\ 30^s$ p.m., at 3220 feet. There are clouds on the same level as the balloon; some clouds below are darker than those above.

At $5^h\ 20^m\ 30^s$ p.m., at 3298 feet. Large masses of cumulus clouds below.

At $5^h\ 21^m\ 30^s$ p.m., at 3218 feet. In fog.

At $5^h\ 23^m$ p.m., at 2924 feet. In wetting fog.

At $5^h\ 24^m$ p.m., at 2386 feet. Scud and clouds of a blackish colour below.

At $5^h\ 26^m\ 30^s$ p.m., at 1793 feet. In black cloud.

At $5^h\ 28^m$ p.m., at 1044 feet. In clouds.

At $5^h\ 29^m\ 30^s$ p.m., at 948 feet. Still in cloud.

At $5^h\ 33^m$ p.m., at 1179 feet. Scud far below.

At $5^h\ 33^m\ 30^s$ p.m., at 1507 feet. Clouds above are darker than those below.

At $5^h\ 37^m$ p.m., at 1330 feet. In cloud, very dark.

Direction of the Wind.

March 31.

At $4^h\ 58^m$ p.m., at 18,302 feet. Moving S.W.

At $4^h\ 58^m\ 30^s$ p.m., at 17,097 feet. Changed our course, moving N.E.

At $5^h\ 2^m$ p.m., at 17,636 feet. In a S.W. current, moving N.E.

At $5^h\ 12^m$ p.m., at 20,865 feet. In a nearly westerly current.

At $5^h\ 42^m\ 30^s$ p.m., at 15,714 feet. In a westerly current.

At $6^h\ 15^m$ p.m., at 4441 feet. Fell in with a S.E. current; are over Ilford.

At $6^h\ 16^m$ p.m., at 5168 feet. Changed our course, moving back again.

April 18.

Before starting the wind was N.E.

At $1^h\ 30^m$ p.m., at 11,055 feet. The wind changed to N.

June 26.

Before starting the wind was blowing W.S.W. strongly.

At $1^h\ 32^m$ p.m., at 17,144 feet. Apparently calm.

July 11.

Before starting the wind was E.

At $4^h\ 59^m\ 30^s$ p.m., at 2633 feet. Balloon entered a N. current.

At $7^h\ 14^m$ p.m., at 1876 feet. Balloon entered an E. current.

At $7^h\ 47^m$ p.m., at 1483 feet. Balloon again entered an E. current.

At $7^h\ 56^m\ 45^s$ p.m., at 1020 feet. Balloon entered a S.E. current.

At $7^h\ 57^m$ p.m., at 1000 feet. Balloon changed its course, moving W.

July 21.

Before starting the wind was S. by E.

At $5^h\ 7^m$ p.m., at 2642 feet. Balloon entered a S.W. current, moving N.E.

At $5^h\ 9^m\ 30^s$ p.m., at 1840 feet. Balloon turned to move back again.

Velocity of the Wind by the Balloon, and by Robinson's Anemometer at the Royal Observatory, Greenwich.

On March 31 the balloon left the Crystal Palace, Sydenham, at $4^h\ 16^m$ p.m., and fell at Barking, in Essex, a point 15 miles from the place of ascent, at $6^h\ 30^m$ p.m. Neglecting all motion of the balloon, excepting the distance between the places of ascent and descent, its hourly velocity was 7 miles; the horizontal movement of the air at Greenwich, as shown by Robinson's anemometer, was 5 miles per hour.

On April 18 the balloon left the Crystal Palace at $1^h\ 16^m$ p.m., and descended at Newhaven at $2^h\ 46^m$. The distance is about 45 miles in $1\frac{1}{2}$ hour, or at the rate of 30 miles per hour. Robinson's anemometer had registered less than 2 miles per hour.

On June 26 the balloon left Wolverton at 1h 2m p.m., and fell at Littleport at 2h 28m p.m. The distance between these two places is 60 miles; the hourly velocity was therefore 42 miles per hour. The anemometer at Greenwich registered 10 miles per hour.

On July 11 the balloon left the Crystal Palace at 4h 53m p.m., and fell at Goodwood at 8h 50m p.m., having travelled 70 miles, or at the rate of 18 miles per hour. The anemometer at Greenwich registered less than 2 miles per hour.

On July 21 the balloon left the Crystal Palace at 4h 52m p.m., and fell near Waltham Abbey, having travelled about 25 miles in 53 minutes, or at the rate of 29 miles per hour. The horizontal movement of the air by Robinson's anemometer was at the rate of 10 miles per hour.

Propagation of Sound.

March 31.

At 5h 57m 30s p.m., at 13,614 feet. Heard some sounds.
At 6h 3m p.m., at 10,917 feet. A railway train heard.

June 26.

At 1h 16m p.m., at 8888 feet. There was a sighing or moaning of the wind heard as preceding a storm; this continued for some time, and is the first instance of the kind that either Mr. Coxwell or myself have experienced. It was in no way owing to the cordage of the balloon, but appeared to be beneath, as if from conflicting currents below us.

At 1h 31m 30s p.m., at 16,442 feet. A railway train heard.
At 1h 48m p.m., at 21,978 feet. A railway train heard.

July 11.

At 5h 19m p.m., at 4000 feet. The cheering of people at Caterham heard.
At 6h 20m p.m., at 5772 feet. People heard shouting.
At 7h 56m 30s p.m., at 1000 feet. Cries of "come down" heard.
At 8h 1m 30s p.m., at 808 feet. A pack of hounds baying at us.
At 8h 4m p.m., at 1241 feet. Frightened geese heard cackling.
At 8h 9m p.m., at 1145 feet. A bugle heard.
At 8h 14m p.m., at 1532 feet. Bugle heard again.

July 21.

At 5h p.m., at 2488 feet. A railway train and the hum of London heard; also bell tolling 5 o'clock heard.

At 5h 1m p.m., at 2610 feet. Hammering heard.

Physiological Observations.

March 31.

At 4h 46m 30s p.m., at 16,669 feet. Mr. Glaisher's heart beats very loud, but not Mr. Coxwell's.

At 5h p.m., at 17,205 feet. Face very blue; feet very cold.
At 5h 24m+p.m., at 20,910 feet. Breathing deeply.
At 5h 25m p.m., at 21,860 feet. Hands blue.

At 5h 31m p.m., at 16,486 feet. Mr. Glaisher's pulsations 97 per minute; Mr. Coxwell's 98 per minute.

At 5h 47m 40s p.m., at 16,080 feet. Very cold.

At 6h p.m., at 11,953 feet. Mr. Coxwell's hands felt as if they were scalded; he was unable to lower the grapnel.

At 6h 3m p.m., at 10,917 feet. Face a glowing purple.
At 6h 5m p.m., at 9570 feet. Violent retching.
At 6h 8m p.m., at 7907 feet. A feeling of illness.
At 6h 9m p.m., at 7443 feet. Vomiting.

April 18.

At 1h 42m p.m., at 17,057 feet. A stream of cold to sense.

At 1h 48m p.m., at 18,886 feet. A general tinge over the countenance; heart slightly affected.

At 1h 52m 50s p.m., at 20,163 feet. Face of a bluish-white colour.

At 2h p.m., at 20,943 feet. Mr. Glaisher's pulsations varied from 90 to 95 per minute; Mr. Coxwell's from 98 to 113; Mr. Ingelow's kept at 130. Mr. Glaisher's pulse was weak; Mr. Ingelow's full and strong.

At 2h 13m p.m., at 21,760 feet. Air very dry to sense.

June 26.

At 1h 7m 20s p.m., at 3029 feet. It was painfully cold.

At 1h 11m p.m., at 6477 feet. Dreadfully cold; I put on a coat with difficulty; wrapped up my neck; also put on an extra cap, and gave Mr. Coxwell a wrapper.

At 1h 22m p.m., at 14,203 feet. Mr. Coxwell complained of pains in his hands, which were of a dark-blue colour.

The Lines in the Spectrum.

March 31.

Before starting B was the boundary-line at the red end, and a little past G at the violet end when looking at the sky. When looking at the sun H was not distinctly seen.

At 4h 20m p.m., at about half a mile high. The spectrum was the same as on the earth, but the extreme lines were seen with less distinctness.

At 4h 29m p.m., at 7557 feet. Sky spectrum very bright, less lines at the red and violet ends. G is quite the limit, B cannot be seen, and C is doubtful.

At 4h 39m p.m., at 12,000 feet. Can see to the line F in the sky spectrum; violet dull; no lines can be seen beyond D.

At 4h 42m p.m., at 13,700 feet. Lost sight of the violet end of the sky spectrum; no lines can be seen at all.

At 4h 45m p.m., at 15,793 feet. Sky spectrum very short; no lines; can see a little beyond D to E, not F.

At 4h 49m p.m., at 17,616 feet. No lines visible in the sky spectrum; faint violet rays as far as G.

At 5h 10m p.m., at 19,356 feet. No sky spectrum at all.
At 5h 23m p.m., at 20,749 feet. No sky spectrum at all.
At 5h 43m p.m., at 16,080 feet. No sky spectrum at all.
At 5h 58m 30s p.m., at 12,797 feet. No sky spectrum; probably not sufficient light.

April 18.

Before starting the solar spectrum extends from B to nearly H, and the sky spectrum from B to G; these lines were quite the limit.

At 1^h 20^m p.m., at 3555 feet. The spectroscope was directed to the sky near the sun; G was very clear; can see H and far beyond.

At 1^h 21^m 10^s p.m., at 4392 feet. Very many lines in the sky spectrum; the line B is clear.

At 1^h 27^m p.m., at 7764 feet. Sky spectrum from B up to A.

At 1^h 27^m 30^s p.m., at 7764 feet. Beyond H and A in the sky spectrum, under and near the sun, lines beautifully defined; requires great change of focus to see A and H. When spectrum is directed at some distance from the sun can see B and several lines beyond.

At 1^h 29^m p.m., at 10,020 feet. Sky spectrum short.

At 1^h 53^m p.m., at 20,163 feet. Examined slit of apparatus; all seems right.

At 2^h 12^m p.m., at 21,646 feet. No sky spectrum; no lines.

At 2^h 15^m p.m., at 22,041 feet. Solar spectrum extended a good way beyond H at the violet end. On passing from the sun the spectrum shortened, and G was the limit; this was soon lost and the spectrum shortened rapidly.

At 2^h 15^m p.m., at 22,041 feet. On approaching the sun again the yellow first appeared, and when very near the sun on all sides the spectrum was perfect, increasing in length the nearer it approached the sun; and when a beam of light came from the sun itself the whole spectrum was visible, and many lines between A and *a* and *a* and B. On passing from the sun the same phenomena were repeated as before; and when the sun again came round, from A to a good way beyond H was examined, and every line was seen that was visible from the earth, and a good many more.

June 26.

At the highest point the sky spectrum was the same as on the earth.

July 11.

At 5^h 28^m p.m., at 3581 feet. Sky spectrum from B to G seen.

DIFFERENT APPEARANCES OF THE GAS.

March 31.

At 4^h 41^m p.m., at 13,070 feet. Gas very thick.
At 4^h 47^m p.m., at 17,060 feet. Gas issuing from the neck of the balloon.
At 4^h 48^m p.m., at 17,451 feet. Gas yellow and opaque.
At 5^h 57^m p.m., at 13,614 feet. Gas very clear.

April 18.

At 1^h 38^m p.m., at about 15,000 feet. Gas clear.
At 1^h 54^m p.m., at 20,163 feet. Gas clear.

June 26.

At 1^h 33^m p.m., at 17,242 feet. Gas seen rushing out of the balloon in volumes.

July 21.

At 4^h 55^m p.m., at 2095 feet. Gas very cloudy.
At 4^h 59^m p.m., at 2550 feet. Gas getting clearer.

At 5^h 19^m 30^s p.m., at 3220 feet. Gas thick and opaque.

At 5^h 26^m 30^s p.m., at 1793 feet. Gas beautifully clear, so that the netting can be seen through the balloon.

At 5^h 34^m 15^s p.m., at 1960 feet. Gas thick and opaque.

MISCELLANEOUS OBSERVATIONS.

March 31.

At 4^h 24^m p.m., at 5296 feet. London looks beautiful; Isle of Dogs visible at about the distance of one mile.

At 4^h 46^m 30^s p.m., at 16,669 feet. The sun's shape well defined as reflected in the water; St. Katherine's Docks apparently 10 miles distant; the Crystal Palace apparently nearly under us.

At 4^h 50^m p.m., at 18,304 feet. The earth looks beautiful; the mouth of the Thames appears almost under us; the coast is visible to Dover; can see Brighton and the sea beyond.

At 4^h 52^m p.m., at 17,400 feet. Just over Isle of Dogs; the Royal Observatory visible; the Green Man Hotel, Blackheath, distinct; can see the rippling of the water below Putney Bridge.

At 5^h 4^m p.m., at 18,293 feet. Apparently over the Isle of Dogs.
At 5^h 8^m 50^s p.m., at 19,197 feet. Apparently over Victoria Docks.

At 5^h 26^m p.m., at 22,068 feet. Mouth of the Thames visible, and the coast is clear to Yarmouth.

At 5^h 34^m p.m., at 15,149 feet. The Thames and country visible for miles.
At 5^h 45^m p.m., at 16,080 feet. Chelmsford in sight.
At 5^h 46^m p.m., at 16,080 feet. East coast clear; Ipswich in sight.
At 5^h 52^m p.m., at 15,630 feet. Darkness is creeping over the earth.
At 6^h 24^m p.m., at 1260 feet. Over Romford or Ilford.
At 6^h 25^m 30^s p.m., at 893 feet. Packed up the instruments in a hurry.

April 18.

At 1^h 21^m 10^s p.m., at 4392 feet. Crystal Palace and grounds well seen.
At 1^h 33^m p.m., at 12,970 feet. Balloon full.

At 1^h 48^m p.m., at 18,886 feet. The largest field appears to be three inches square; lowered the grapnel.

At 2^h 31^m 30^s p.m., at 23,324 feet. Looked at the sun with red, blue, and yellow glass for anything like prominences; edge without appendages of any kind.

June 26.

At 2^h 20^m 20^s p.m., at 9148 feet. Two canals in sight; straight for many miles.

July 11.

At 5^h 36^m p.m., at 2332 feet. Over Epsom Downs.
At 5^h 37^m p.m., at 2469 feet. About five miles from Reigate.
At 5^h 39^m p.m., at 2424 feet. Sand out.

At 5^h 43^m 30^s p.m., at 2488 feet. The two towers of the Crystal Palace not quite in a straight line with us.

At 5^h 45^m p.m., at 2488 feet. Sand out.
At 5^h 49^m p.m., at 2820 feet. Near Reigate.
At 5^h 51^m p.m., at 2762 feet. A very fine view; crossing high road.
At 6^h 4^m p.m., at 3250 feet. Sand out.

At $6^h\ 13^m$ p.m., at 5105 feet. Sand out.
At $6^h\ 16^m$ p.m., at 5382 feet. Over Horsham.
At $6^h\ 52^m$ p.m., at 6453 feet. The coast at Brighton is distinctly visible.
At $7^h\ 7^m\ 30^s$ p.m., at 3645 feet. Near Newhaven.
At $8^h\ 6^m\ 30^s$ p.m., at 1144 feet. Over a very extensive wood.
At $8^h\ 7^m\ 15^s$ p.m., at 1048 feet. We are apparently four or five miles from the coast.
At $8^h\ 14^m$ p.m., at 1532 feet. Goodwood Park visible.
At $8^h\ 32^m\ 30^s$ p.m., at 666 feet. Over Goodwood Park.
At $8^h\ 34^m$ p.m., at 1085 feet. Packed up instruments.

July 21.

At $4^h\ 52^m\ 10^s$ p.m. Balloon left the earth.
At $4^h\ 53^m$ p.m., at 1439 feet. Crystal Palace still visible.
At $5^h\ 5^m$ p.m., at 2890 feet. Docks and River Thames visible; ships visible; over Greenwich.
At $5^h\ 6^m$ p.m., at 2750 feet. Over West India Docks.
At $5^h\ 11^m\ 30^s$ p.m., at 1300 feet. Over Walthamstow; carts visible.
At $5^h\ 12^m$ p.m., at 1120 feet. Nearly over Victoria Park.
At $5^h\ 12^m\ 15^s$ p.m., at 1030 feet. Over East London Cemetery.
At $5^h\ 29^m\ 30^s$ p.m., at 948 feet. Can hear the pattering of rain on the trees of Epping Forest.
At $5^h\ 35^m$ p.m., at 1898 feet. The grapnel and half the rope are invisible.
At $5^h\ 39^m$ p.m., at 996 feet. Changed direction, passing over the Forest; can see sheep clearly.

Meteorological Observations made in connexion with the Balloon Ascent on

March 31.

ROYAL OBSERVATORY, GREENWICH.

Time of observation.	Reading of Barom. reduced to 32° F.	Thermom. Dry.	Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
2 0 p.m.	30·09	47·8	42·2	36·0	·212	64	E.S.E.	5	0	Cirrus, cumulus, cirrostratus, [and cirrocumulus.
2 10 ,,	30·09	49·6	44·4	38·8	·236	67	S.E.	5	...	Cirrus, cumulus, cirrostratus, and cumulostratus.
2 20 ,,	30·09	50·4	44·2	37·6	·225	62	...	4	...	
2 30 ,,	30·08	49·8	43·8	37·4	·224	63	E.	4	...	
2 40 ,,	30·08	49·8	43·8	37·4	·224	63	E.S.E.	5	...	
2 50 ,,	30·08	48·3	42·6	36·4	·215	63	S.E.	6	...	
3 0 ,,	30·08	47·0	41·6	35·5	·208	65	...	5	0	Cirrus, cumulus, cirrocumulus, cirrostratus, and cumulostratus.
3 10 ,,	30·08	49·3	43·1	36·4	·215	61	S.S.E.	5	...	
3 20 ,,	30·08	50·5	44·3	37·7	·226	62	S.S.E.	6	...	
3 30 ,,	30·08	48·3	42·6	36·3	·214	63	S.E.	4	...	Cirrus, cirrocumulus, and cirrostratus.
3 40 ,,	30·08	48·1	42·4	36·1	·213	63	...	4	...	
3 50 ,,	30·08	48·5	42·8	36·5	·216	63	...	2	...	Cirrus, cumulus, and cirrostratus.
4 0 ,,	30·08	48·4	42·7	36·4	·215	64	...	2	0	
4 10 ,,	30·07	47·8	42·3	36·2	·214	65	E.S.E.	0	...	Cloudless, with the exception of a little cirrus and cumulostratus.

Meteorological Observations made in connexion with the Balloon Ascent on March 31 (*continued*).

ROYAL OBSERVATORY, GREENWICH.

Time of observation.	Reading of Barom. reduced to 32° F.	Thermom. Dry.	Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
4 20 p.m.	30·07	47·6	42·3	36·4	·215	66	...	0	...	Balloon seen to rise; it then took a westerly direction.
4 30 ,,	30·07	47·5	42·2	36·3	·214	65	...	0	...	About this time the balloon changed, and took a direction nearly E.N.E.
4 40 ,,	30·07	46·3	41·3	35·6	·208	67	...	0	...	
4 50 ,,	30·07	45·5	40·4	34·5	·199	65	...	0	0	Cloudless. Sand appeared to rise above the balloon.
5 0 ,,	30·07	45·6	40·7	35·1	·196	67	...	0	...	Cloudless. Balloon exactly over the Royal Observatory. It was moving in a direction nearly E.S.E.
5 10 ,,	30·07	44·5	39·3	33·2	·189	64	...	0	...	On looking through the 30 in. achromatic telescope, the face and shoulders of one of the aëronauts were seen.
5 20 ,,	30·07	44·1	39·1	33·2	·189	65	...	0	...	Ballast thrown out. The netting of balloon distinctly seen by aid of telescope.
5 30 ,,	30·07	43·6	38·6	32·6	·185	65	...	0	...	Cloudless. Balloon E.N.E. of Royal Observatory.
5 40 ,,	30·07	43·4	38·4	32·5	·184	65	...	0	...	
5 50 ,,	30·08	42·7	38·1	32·5	·184	67	...	0	...	
6 0 ,,	30·08	42·4	37·7	32·0	·181	68	...	0	0	
6 10 ,,	30·08	42·2	37·5	31·8	·179	68	...	0	...	
6 20 ,,	30·08	41·9	37·3	31·7	·179	67	...	0	...	
6 30 ,,	30·08	41·1	36·9	31·7	·179	69	...	0	...	
6 40 ,,	30·08	40·6	36·7	31·7	·179	71	...	0	...	
6 50 ,,	30·08	40·3	36·5	31·6	·178	71	...	0	...	
7 0 ,,	30·08	40·0	36·3	31·5	·177	71	E.S.E.	0	...	
9 0 ,,	30·09	37·1	34·4	29·8	·166	77	S.E.	0	0	Cloudless; a very fine bright evening.

April 18.

ROYAL OBSERVATORY, GREENWICH.

Time of observation.	Barom. reduced to 32° F.	Dry.	Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
Noon.	30·09	60·2	54·2	48·9	·346	66	N.N.E.	10	0	Generally overcast; light clouds
0 10 p.m.	30·09	59·6	53·7	48·5	·342	68	...	8	...	Cirrus, cirrocumulus, and cumulostratus.
0 20 ,,	30·09	61·2	55·6	50·7	·370	69	...	7	...	
0 30 ,,	30·09	61·6	55·7	50·6	·369	69	...	10	...	
0 40 ,,	30·09	60·4	55·3	50·9	·373	71	N.E.	6.	...	Cirrus, cirrocumulus; dense cirrostratus in S.E.; clear in N.
0 50 ,,	30·09	62·9	56·3	50·7	·370	65	...	6	...	Cirrus, cumulus, cirrostratus, and cirrocumulus.
1 0 ,,	30·09	62·2	56·0	50·6	·369	66	N.N.E.	7	0	
1 10 ,,	30·09	61·5	55·8	50·9	·373	69	N.E.	8	...	Cirrus, cirrostratus, and cirrocumulus.
1 20 ,,	30·10	59·2	54·2	49·7	·357	71	...	8	...	
1 30 ,,	30·10	58·7	53·6	49·0	·348	70	...	8	...	
1 40 ,,	30·10	58·2	52·9	48·1	·336	70	...	7	...	Cirrus, cumulus, cumulostratus, and cirrostratus.
1 50 ,,	30·10	59·7	53·6	48·2	·338	66	N.N.E.	7	...	
2 0 ,,	30·10	58·8	59·3	48·3	·339	67	...	6	0	
2 10 ,,	30·10	59·3	53·5	48·4	·340	68	...	5	...	

Meteorological Observations made in connexion with the Balloon Ascent on

April 18 (*continued*).

ROYAL OBSERVATORY, GREENWICH.

Time of observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
2 20 p.m.	30·10	59·1	53·2	48·0	·335	67	...	6	...	Cirrus, cumulus, cirrocumulus, and cirrostratus.
2 30 „	30·10	61·9	55·1	49·3	·352	63	N.E.	6	...	
2 40 „	30·10	59·2	53·0	47·5	·329	65	...	5	...	
2 50 „	30·10	59·7	53·3	47·6	·330	65	N.N.E.	4	...	Cirrus, cumulus, cirrocumulus, and cumulostratus.
3 0 „	30·10	60·6	54·2	48·6	·343	65	...	4	o	
3 30 „	30·09	58·1	51·8	46·1	·312	65	...	6	...	Cirrus, cirrocumulus, cumulus, and cumulostratus.
3 40 „	30·10	57·4	51·4	46·0	·311	65	...	5	...	
3 50 „	30·10	57·7	52·0	46·8	·321	67	...	5	...	
4 0 „	30·10	58·1	51·8	46·1	·312	65	N.N.E.	6	o	

June 26.

ROYAL OBSERVATORY, GREENWICH.

Noon.	30·00	72·4	59·4	49·7	·357	45	W.S.W.	4	2	Cumulus, cirrocumulus, and cirrus.
0 10 p.m.	30·00	72·5	60·4	51·4	·379	48	W.S.W.	4	...	
0 20 „	29·99	71·2	60·3	52·0	·388	51	S.W.	5	...	Cumulus, cirrus, and cirrocumulus in the zenith.
0 30 „	29·99	72·4	61·1	52·7	·399	50	W.	4	...	Cumulus, cirrocumulus, and cirrus; the zenith is clear.
0 40 „	29·99	73·3	62·0	53·7	·413	50	W.	5	...	Cumulus; cirrocumulus in the zenith and cirrus.
0 50 „	29·99	73·2	62·9	55·3	·437	53	W.S.W.	5	...	
1 0 „	29·99	72·9	61·2	52·6	·397	49	...	4	...	Cirrus and cirrocumulus.
1 10 „	29·98	74·0	62·5	54·1	·419	50	...	5	...	
1 20 „	29·98	73·4	61·8	53·3	·407	49	W.S.W.	5	...	Cirrus, cirrostratus, and cirrocumulus.
1 30 „	29·98	72·4	60·7	52·0	·388	49	W.	6	...	
1 40 „	29·98	72·5	61·1	52·6	·397	50	W.S.W.	6	...	
1 50 „	29·98	73·9	61·5	52·5	·396	47	W.	4	...	
2 0 „	29·98	73·1	61·5	52·9	·401	50	W. by S.	4	...	
2 10 „	29·97	72·1	60·7	52·1	·389	50	W.	8	...	Cirrocumulus, cirrostratus, and cirrus.
2 20 „	29·97	72·0	60·0	51·0	·374	48	W.	8	...	
2 30 „	29·97	70·8	59·5	50·8	·371	50	W.	9	...	Cirrocumulus, cirrostratus, and cirrus.
2 40 „	29·97	70·7	59·0	50·0	·361	48	W. by S.	9	...	Cirrocumulus, cirrus, and cirrostratus.
2 50 „	29·97	72·4	61·1	52·7	·399	50	W.S.W.	10	...	Overcast; cirrostratus principally, with a little cirrus and cirrocumulus.
3 0 „	29·97	70·2	59·0	50·4	·366	49	W. by S.	10	o	
3 10 „	29·96	69·4	58·7	50·5	·367	51	W. by S.	10	...	
3 20 „	29·96	69·4	59·1	51·1	·375	52	W. by S.	10	...	
3 30 „	29·96	68·9	58·9	51·1	·375	52	W.	10	...	Overcast; nearly all cirrostratus.
3 40 „	29·96	68·3	58·2	50·3	·365	52	W.N.W.	10	...	
3 50 „	29·96	67·1	58·5	51·6	·382	58	W.N.W.	10	...	
4 0 „	29·96	67·0	58·1	51·0	·374	56	W.N.W.	10	o	
4 10 „	29·96	66·7	58·6	52·0	·389	60	W.N.W.	10	...	Overcast; cirrostratus; sun shining faintly through the cloud.
4 20 „	29·96	65·3	57·5	51·1	·375	60	W.N.W.	10	...	Overcast; cirrostratus.
4 30 „	29·96	64·5	56·5	49·9	·360	59	N.W.	10	...	
4 40 „	29·96	63·9	56·3	50·0	·361	60	N.W.	10	...	Overcast; few drops of rain.
4 50 „	29·96	62·7	56·2	50·6	·369	65	N.W.	10	...	
5 0 „	29·96	61·8	55·9	56·9	·37	69	N.W.	10	o	Overcast; continuous rain.

Meteorological Observations made in connexion with the Balloon Ascent on

June 26 (*continued*).

WOLVERTON.

Time of observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
0 55 p.m.	29·85	67·3	59·0	52·4	·394	59	Wind unknown.			
1 0 „	29·83	67·0	61·0	56·2	·453	68				
1 15 „	29·83	67·8	58·0	50·2	·364	53		10	...	Balloon in sight; very cloudy; [brisk wind.
1 25 „	29·83	65·9	57·3	50·2	·364	57		10	...	Balloon out of sight at 1h 18m; cloudy.
1 30 „	29·82	66·4	57·8	50·8	·371	58		10	...	
1 35 „	29·82	66·0	56·6	48·9	·346	54		10	...	
1 40 „	29·82	66·0	57·3	50·2	·364	57		10	...	
1 45 „	29·83	65·2	57·0	50·7	·370	60		10	...	
1 50 „	29·82	65·0	57·0	50·4	·366	59		10	...	Cloudy.
1 55 „	29·81	64·5	57·0	52·1	·389	65		10	...	
2 0 „	29·81	65·0	57·0	50·4	·366	59		10	...	
2 5 „	29·82	64·8	57·0	52·6	·397	66		10	...	
2 10 „	29·83	64·7	56·3	50·4	·366	61		10	...	Clouds thicker.
2 20 „	29 83	63·4	55·8	48·3	·339	58		10	...	
2 25 „	29·83	63·4	55·8	48·3	·339	58		10	...	
2 30 „	29·84	63·7	55·8	49·1	·349	59		10	...	
2 40 „	29·84	64·0	56·0	49·4	·351	59		10	...	Raining.
2 45 „	29·82	62·0	57·0	52·7	·399	72		10	...	
2 50 „	29·82	63·0	57·0	51·9	·387	67		10	...	
2 55 „	29·82	63·0	57·0	51·9	·387	67		10	...	
3 0 „	29·82	62·8	57·0	54·2	·421	76		10	...	
3 5 „	29·82	61·3	56·0	52·2	·391	74		10	...	
3 10 „	29·82	61·0	55·2	49·6	·356	66		10	...	Little rain.
3 15 „	29·82	61·0	55·0	49·8	·358	67		10	...	
3 20 „	29·82	61·0	54·3	47·7	·332	61		10	...	
3 25 „	29·82	60·0	54·0	48·7	·344	66		10	...	
3 30 „	29·82	59·9	54·0	48·7	·344	66		10	...	No rain.
3 35 „	29·82	60·0	54·0	48·7	·344	66		10	...	
3 40 „	29·82	60·8	54·4	49·9	·360	68		10	...	
3 45 „	29·82	60·0	54·0	48·7	·344	68		10	...	Raining fast.
3 50 „	29·82	60·0	53·3	47·0	·318	61		10	...	
3 55 „	29·80	59·0	53·3	47·7	·330	69		10	...	
4 0 „	29·80	59·0	53·2	47·9	·328	65		10	...	

July 11.

ROYAL OBSERVATORY, GREENWICH.

Noon.	30·23	76·8	66·5	59·2	·503	55	E.S.E.	5	o	Cirrus and haze principally; a little cirrostratus.
0 10 p.m.	30·23	76·6	66·4	59·2	·503	55	E.S.E.	5	...	
0 20 „	30·22	77·2	66·1	58·4	·489	53	E.	5	...	
0 30 „	30·22	77·2	66·1	58·4	·489	53	E.S.E.	6	...	
0 40 „	30·22	77·2	65·8	57·9	·480	52	E. by N.	6	...	
0 50 „	30·22	76·0	64·3	56·0	·449	50	S.E.	5	...	
1 0 „	30·22	77·2	64·8	56·1	·451	50	S.E.	6	o	
1 10 „	30·22	77·8	64·7	55·6	·443	48	E.S.E.	6	...	
1 20 „	30·22	76·8	63·8	54·1	·419	46	E.S.E.	5	...	
1 30 „	30·20	76·7	63·5	54·3	·422	47	S.E.	6	...	Cirrus and haze principally; a little cirrostratus.
1 40 „	30·21	76·2	63·0	53·7	·413	46	S.E.	7	...	

Meteorological Observations made in connexion with the Balloon Ascent on

July 11 (*continued*).

ROYAL OBSERVATORY, GREENWICH.

Time of observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
1 50 p.m.	30·21	77·3	63·2	53·3	·407	44	E.S.E.	9	...	Cirrus and haze.
2 0 "	30·21	77·3	62·9	52·8	·400	43	E.	9	0	Cirrus, cirrostratus, and haze.
2 10 "	30·21	76·1	62·2	52·3	·393	44	E.S.E.	9	...	Cirrus, cirrocumulus, and haze.
2 20 "	30·21	75·8	61·6	51·4	·379	43	E.	9	...	
2 30 "	30·21	73·7	61·4	52·4	·394	47	E.	10	...	Overcast, with light cloud, chiefly cirrostratus.
2 40 "	30·21	73·9	61·7	52·8	·400	47	S.E.	10	...	
2 50 "	30·20	73·3	61·2	52·2	·391	48	S.E.	9	...	Cirrostratus and a little cirrocumulus.
3 0 "	30·20	74·4	61·8	52·7	·399	46	S.E.	9	0	
3 10 "	30·20	75·1	62·1	52·7	·399	46	E.S.E.	9	...	
3 20 "	30·20	74·6	61·6	52·1	·389	46	E.	8	...	
3 30 "	30·20	74·5	61·5	51·1	·389	46	S.E.	8	...	
3 40 "	30·19	74·1	61·2	51·7	·384	46	E.S.E.	8	...	
3 50 "	30·19	73·8	60·6	50·9	·373	45	E.S.E.	8	...	Cirrostratus.
4 0 "	30·19	74·1	61·0	51·4	·379	45	E.	8	0	Cirrostratus; the blue sky has been in the S.E. since the [clouds first began to break.
4 10 "	30·19	74·1	61·1	51·6	·382	45	E.S.E.	8	...	
4 20 "	30·19	74·3	60·9	51·1	·375	44	E.S.E.	8	...	Cirrus and cirrostratus.
4 30 "	30·19	74·5	60·8	50·9	·373	44	E.	8	...	
4 40 "	30·19	74·8	60·9	50·8	·371	43	E.	7	...	
4 50 "	30·18	74·9	61·0	51·0	·374	43	E.S.E.	7	...	
5 0 "	30·18	74·1	61·3	51·9	·386	46	E.S.E.	6	...	
6 0 "	30·18	69·9	60·6	53·4	·409	55	S.E.	9	...	Thin cirrus and cirrostratus generally prevalent.
9 0 "	30·19	62·5	58·0	54·2	·421	75	S.E.	1	2	Few light clouds scattered here and there.

July 21.

ROYAL OBSERVATORY, GREENWICH.

Time of observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
5 10 p.m.	29·52	61·0	61·5	61·0	·537	100	S.S.E.	10	3	Overcast; rain has fallen almost continuously since 3 o'clock; thin rain falling.
5 20 "	29·52	61·0	61·5	61·0	·537	100	S.S.E.	10	...	Overcast.
5 30 "	29·52	61·2	60·7	60·1	·520	97	S.S.E.	10	...	
5 40 "	29·51	61·2	60·7	60·1	·520	97	S.S.E.	10	...	
5 50 "	29·51	60·9	60·5	60·3	·524	98	S.S.E.	10	...	Overcast; rain just commenced [falling heavily.
6 0 "	29·51	60·9	60·5	60·3	·524	98	S.S.E.	10	3	Overcast; rain still falling.
6 10 "	29·51	60·7	60·3	60·0	·518	98	S.S.E.	10	...	
6 20 "	29·50	60·5	60·2	60·0	·518	98	S.S.E.	10	...	
6 30 "	29·50	60·4	60·2	60·1	·520	99	S.S.E.	10	3	

[*From the* REPORT *of the* BRITISH ASSOCIATION *for the* ADVANCEMENT *of* SCIENCE *for* 1864.]

AN ACCOUNT

OF

METEOROLOGICAL AND PHYSICAL OBSERVATIONS

MADE IN

NINE BALLOON ASCENTS IN THE YEARS 1863 AND 1864.

(IN CONTINUATION OF THIRTEEN MADE IN THE YEAR 1862 AND FIRST PART OF 1863).

BY

JAMES GLAISHER, F.R.S.

An Account of Meteorological and Physical Observations in Nine Balloon Ascents made in the years 1863 *and* 1864 (*in continuation of thirteen made in the year* 1862 *and first part of* 1863), *under the auspices of the Committee of the British Association for the Advancement of Science, by* James Glaisher, *F.R.S., at the request of the Committee, consisting of Colonel Sykes, the Astronomer Royal, Lord Wrottesley, Sir D. Brewster, Sir J. Herschel, Dr. Lloyd, Admiral FitzRoy, Dr. Lee, Dr. Robinson, Mr. Gassiot, Mr. Glaisher, Prof. Tyndall, Dr. Fairbairn, and Dr. W. A. Miller.*

The Committee on Balloon Experiments was appointed last year for the following purposes:—

1st. To examine the electrical condition of the air at different heights.

2nd. To verify the law of the decrease of temperature, and to compare the constants in different states of the atmosphere.

With respect to the first of these objects, no progress whatever has been

made in the past year, with the exception of preparing an instrument and apparatus for the investigation.

At the request of the Committee Mr. Fleeming Jenkin kindly undertook to superintend the construction of the instrument best adapted for the purpose, but it unfortunately happens that no flame or fire of any kind can be admitted into the car of the balloon for fear of igniting the gas, and this instrument, which was furnished a little before the end of the year 1863, was constructed to be used with fire. It therefore had to be altered so that it could be used with water, but is not yet quite in a state for observation.

It happens unfortunately that electrical experiments in balloons necessitate the use of one constant flow of water, and occasionally of two flowing at the same time, just below the car of the balloon.

The Committee felt that the presence of water but little removed from the instruments, if exercising no influence when the balloon was rising, might exercise such an influence on the balloon falling and passing through the just moistened atmosphere as to throw a very considerable doubt on some of the experiments, particularly on those relating to the humidity of the air (a primary object of research), that I was requested to defer taking them, that no doubt might rest on the results, till our knowledge on this subject was much increased.

The Committee consider that the general laws on the humidity of the air have now so advanced, that electrical experiments may now be included, providing that such observations can be made with safety to ourselves.

With respect to the second of these objects, viz. verifying the law of the decrease of temperature in different states of the atmosphere. The Committee considered that this would be best attained by taking as many observations as possible, at times in the year and at times in the day at which no experiments had been made, for the purpose of determining whether *the laws which hold good at one time in the year, hold good at other times in the year*, and also to determine whether the laws which hold good at noon, apply equally well at all other times in the day.

The Committee at all times have pressed on me the importance of magnetic observations in the higher regions of the atmosphere, the Astronomer Royal suggesting the use of a horizontal magnet, and taking the times of its vibration at different elevations, a method which is seldom practicable, owing to the balloon almost constantly revolving on its own axis. To obviate the effect of this, Dr. Lloyd suggested the use of a dipping-needle placed horizontal when on the ground by means of a magnet adjustible above it, so that when in the balloon the deviation from horizontality might be readily noticed, and which deviation would be independent of the revolving motion of the balloon, and could thus be noticed at any instant.

I have been unable to attempt the latter method, as Dr. Lloyd wished some experiments to be made before the instrument should be constructed.

At Newcastle a very general wish was expressed by the Members of the Council that I should not ascend to heights exceeding 4 or 5 miles. To this I readily consented, because for the most part, from the preceding experiments, all the observations above 5 miles could have been inferred from those made below 5 miles; and there was another reason, that the balloon, after the many rough descents, had become, in Mr. Coxwell's opinion, too unsafe for extreme high ascents.

I have therefore no report to give upon any extreme high elevation attained during the past year, yet new facts and new physical conditions have become known in some of the nine ascents upon which I have to speak.

§ 1. Instruments and Apparatus.

The instruments used were for the most part the same in construction with those of the two preceding years, consisting of mercurial and aneroid barometers; Daniell's and Regnault's hygrometers; maximum and minimum thermometers, blackened bulb thermometers, both free and enclosed in vacuum tubes; Herschel's actinometer;—all these instruments have been frequently in the hands of Mr. Zambra, who superintended their replacement when broken, and their perfect order at all times; two spectroscopes, one lent by the Astronomer Royal, the other by Mr. Simms; a magnet for horizontal vibration; large caoutchouc bags, furnished by Professor Tyndall, for collecting air at high elevations, ozone-papers, &c.

In all the highest ascents both a mercurial and an aneroid barometer (the one which was used on the ascent of September 5, 1862), and which was found to read in close accordance with the mercurial barometer to very low readings, were used; in the ascents to moderate elevations, the same aneroid was used alone, it being examined both before and after the ascents, with the mercurial barometer, and occasionally with the mercurial barometer when placed in an exhausted receiver under an air-pump.

§ 2. Observing Arrangements

Were precisely similar to those in previous years; viz. in the high ascents, a board was placed across the car which carried the several instruments, so placed as to be readily read by myself, seated at one end of the car, with my face towards Mr. Coxwell; in the other ascents, when a smaller number of instruments were used, they were placed upon a board projecting beyond the car, easily read by myself standing at one end, with my back to Mr. Coxwell.

Circumstances of the Ascents, and General Observations.

The ascents to April 6 were made by the same balloon as all the preceding ascents; those on June 13, 20, and 27 by a new and larger balloon, and that on August 29 by the old balloon.

Ascent from Newcastle, August 31, 1863.—The situation of Newcastle, as regards the Tyne and the sea, is such as to cause anxiety in respect to any balloon ascent from there.

The balloon left the earth at $6^h\ 12^m$ p.m.; the wind was North; in 4 minutes we were over the High-Level Bridge, at an elevation of 1800 feet; we passed over Gateshead at $6^h\ 21^m$, being 1 mile from the earth, and in 10 minutes afterwards the height of $1\frac{3}{4}$ mile was reached.

We continued nearly at this level for some little time, and then began our downward journey; passed into cloud at $6^h\ 54^m$ at the height of 1600 feet, out of it at 1800 feet, in cloud again at 2000 feet, then turned to descend, passing again through clouds at 1900 feet. At $6^h\ 57^m$ we saw Durham Cathedral, and reached the ground at 5 minutes past seven at Pittington, near Durham.

The colours of the clouds observed in this ascent are very remarkable:—

At $6^h\ 32^m\ 30^s$, at 7912 feet high, the colours of the clouds in the east opposite to the sun were as follows:—the upper layer brown; next below bluish black, then a darker bluish black; lower still, a thin layer of white cumulo-stratus, next a greenish brown resting on uniform white rocky clouds.

At $6^h\ 35^m\ 30^s$, at 7329 feet, the colours of the clouds in the west, or under the sun, were as follows:—the upper layer was brown, the second dark blue,

under which was a whitish-greyish black resting on uniform white rocky cumulus clouds.

At $6^h 37^m 10^s$, at the height of 6981 feet, the colours of the clouds in the south were:—the top layer brown, under which was bluish brown, then rocky-brown cumulostratus, below bluish black resting on a base of rocky cumulus.

At $6^h 43^m$, peaks after peaks, apparently rising up to our level, and clearly defined against the sky; cloud with a little red in it not opposite to the sun.

At $6^h 54^m 10^s$, at the height of 1580 feet, colours of clouds were as follows:—top layer deep greenish blue; next bluish black, below green rocky clouds, then slightly rocky cumulus clouds.

Ascent from Wolverhampton, September 29, 1863.—The gas used on this occasion was specially prepared in the month of July, as a high ascent was arranged to have taken place before the Meeting of the Association last year, but circumstances prevented it, and the Directors of the Gas Works had most obligingly devoted a gasometer to our use from July to September, much to their own inconvenience.

The balloon was filled the preceding day, and watched all night. On leaving, Lord Wrottesley quietly said, "Beware of the Wash," at the same time pressing my hand, and repeating, "Beware of the Wash; I fear that is your direction." We left the earth at $7^h 43^m$ a.m. with a cloudy sky and a south-west wind. At $7^h 52^m$, at the height of 3000 feet, the sun's disk was seen, and the earth was obscured by mist.

At $8^h 4^m$, at the height of 6000 feet, clouds were situated both above and below; at $8^h 18^m$, at the height of 8200 feet, there were two layers of clouds below us, and very dense clouds still far above.

When at 11,000 feet clouds were still a mile higher; there was a beautiful sea of cloud below with a blue tinge over its surface, and the peeps of the earth as seen through the breaks in the clouds were beautiful, having a purple hue; when at 13,000 feet, clouds were still at a higher elevation, and after this they began to dissipate; and at $9^h 38^m$, at 14,000 feet, the sun shone brightly, and we thought we might gradually approach a height of 5 miles, and remain in the higher regions till after noon, so that I might make a series of actinometer and blackened bulb observations; but, to our deep regret, at $9^h 48^m$ we found ourselves moving directly for the Wash, as seen through a break in the lower clouds, at an estimated distance of 10 miles only, and we were compelled to begin our descent; at $10^h 19^m$, at the height of 3000 feet, we saw by the bending of the trees that a gale of wind from the south was blowing on the earth, and we had a rough descent, being drawn over hedges, across fields and ditches; indeed so strong was the wind that the balloon was torn from top to bottom, and was very much injured, but it was only by the almost destruction of the balloon that its course was stopped; we ourselves escaped with slight injuries.

Ascent from the Crystal Palace, October 9, 1863.—The balloon left the Crystal Palace at $4^h 29^m$ p.m.; in 4 minutes it was 2500 feet high; at $4^h 46^m$ was 7300 feet, and directly over London Bridge, at which height with one glance the vast number of buildings comprising the whole of London could be seen, some so plainly that the plans of their inner courts could have easily been drawn; in this situation it was difficult to persuade oneself that that small building directly under us was the Cathedral of St. Paul's; we then gradually descended to 2300 feet at $5^h 15^m$, ascended to 3600 feet by $5^h 24^m$, and descended again to 1500 feet by $5^h 36^m$; ascended to 8600 feet by 6^h, and

reached the earth by $6^h 40^m$ at Pirton Grange on the boundaries of Hertford and Bedford.

Ascent from Woolwich Arsenal, January 12, 1864.—The Secretary of State for War, the Right Hon. Earl de Grey and Ripon, having kindly granted permission to the Committee of the British Association to avail themselves of the facilities afforded in the Royal Arsenal, Woolwich, for future balloon ascents for scientific purposes, the ascent took place from there. The ascent was intended to have been made on December 21, the day of the winter solstice, and from this time to the end of the year the balloon was frequently partially inflated: on December 30 it was filled, but its completion was at too late an hour to ascend; it was left filled in the care of watchmen, but a strong wind arose at night, and it was driven against a gasometer, and so injured as to require repairing, and it was not till January 12 that we succeeded.

The balloon on this day left the earth at $2^h 7^m$ p.m.; in 3 minutes the height of 1500 feet was attained; at $2^h 14^m$ we crossed the Tilbury Railway line, and in 7 minutes afterwards we were over Hainault Forest; at $2^h 26^m$ 3000 feet was reached; the first mile was passed at $2^h 32^m$, the second at $3^h 24^m$, and the height of 12,000 feet was attained by $3^h 31^m$. The balloon then began to descend and touched the ground at $4^h 10^m$, at Lakenheath Warren, near Brandon, the descent not having taken one-half the time of ascent.

On the earth the wind was S.E.; at the height of 1300 feet we entered a strong S.W. current; we continued in this current till we reached a height of 4000 feet, when the wind changed to the south; and after some little time we determined upon ascending. At the height of 8000 feet the wind changed to S.S.W.; at the height of 4000 feet the wind changed to S.S.E.; at 11,000 feet we met with fine granular snow; passed through snow on descending till we were within 8000 feet of the earth; entered clouds at 7000 feet, and passed out of them at about 6000 feet into mist.

Ascent from Woolwich Arsenal, April 6, 1864.—This ascent was intended to be made as near March 21 as possible; but although frequent attempts were made, it was not till April 6 that we succeeded.

The balloon left Woolwich on this day at $4^h 7^m$ p.m., with a south-east wind; in 9 minutes, when at the height of 3000 feet, we crossed over the River Thames, ascending very evenly at the rate of 1000 feet in little more than 3 minutes, till 11,000 feet was attained at $4^h 37^m$, and descended at about the same rate till within 1500 feet of the earth, when the rapidity of the descent was checked, reaching the ground at $5^h 25^m$, on the outskirts of a pine plantation in Wilderness Park, near Sevenoaks, in Kent.

Our course in this ascent was most remarkable; having first passed over the River Thames into Essex, we must have repassed and moved in a directly opposite direction, and continued thus till we approached the earth, when we again moved in the same direction as at first.

After the great injury to the balloon on September 29, in addition to the numbers of repairs that it had previously needed, it was not, when again repaired, in such a condition as (in Mr. Coxwell's opinion) to be quite safe to ourselves for extreme high ascents; and after those of January 12 and April 6, having been made at a time of year that any balloon would be most severely tested, Mr. Coxwell determined, before venturing again with myself to any great elevation, to build a new balloon.

This he did, and one of a capacity capable of containing 10,000 cubic feet more than the old one, so that, if need be, two observers could ascend together to the height of 5 miles.

A new balloon, however, needs trying in low ascents till it proves to be gas-tight, before it can be used for great elevations.

Ascent from the Crystal Palace, June 13, 1864.—On this ascent the balloon left the grounds of the Crystal Palace at 7 o'clock. The sky was cloudless, and the air perfectly clear, excepting in the direction of London.

An elevation of 1000 feet was reached in $1\frac{1}{4}$ minute; 3000 feet was attained at $7^h\,8^m$, when the balloon turned to descend, and passed down to 2300 feet by $7^h\,13^m$; on reascending, 3400 feet was gained at $7^h\,20^m$; after taking a slight dip, it again ascended to 3550 feet (the highest point) by $7^h\,28^m$; then descended to 2500 feet, and after several small ascents, began the downward journey at $7^h\,50^m$ from the height of 2800 feet, reaching the ground at East Horndon, 5 miles from Brentwood, at $8^h\,14^m$.

Ascent from Derby, June 20, 1864.—The balloon left Derby at 17 minutes past 6^h p.m.; at $6^h\,30^m$ the height of 1000 feet was reached, the next 1000 feet being passed in half a minute; then ascended less rapidly; cloud was entered at $6^h\,26^m$, 3600 feet being gained, and 4000 feet at $6^h\,30^m$; descended to 2700 feet by $6^h\,36^m$, being over Ilkeston; Nottingham and its race-course were visible at $6^h\,41^m$; we then reascended to 4300 feet at $6^h\,50^m$; on descending, passed over Southwell at $6^h\,56^m$, and touched the ground at $7^h\,16^m$ on a farm at Norwell Woodhouse, near Newark.

Ascent from the Crystal Palace, June 27, 1864.—The balloon left the grounds of the Crystal Palace at $6^h\,33\frac{1}{2}^m$; the sky was cloudy, and the wind was blowing from the West.

At $6^h\,38^m$, when 1000 feet from the earth, we crossed over Penge, reached 1500 feet high at $6^h\,43^m$, descended to 800 feet by $6^h\,48^m$, being over Shortlands; ascended to 1200 feet by $6^h\,52^m$, being over Hayes Common; remained at about this elevation for 8 minutes, descended about 300 feet, and then ascended to 4200 feet by $7^h\,16^m$; descended 1000 feet slowly, and reascended to the height of 5000 feet by $7^h\,42^m$; began to descend, passing over the left of Tonbridge, near the village of Hudlow, and over the Medway on reaching 2400 feet at $8^h\,8^m$; we then ascended 1200 feet, and began to descend again at $8^h\,15^m$, passing between Hawkhurst and Cranbrook; were within 600 feet of the earth at $8^h\,55^m$, being nearly over Tenterden; we then reascended, and in 13 minutes had attained an elevation of 6000 feet, and reached the earth at $9^h\,21^m$ in Romney Marsh, about half a mile from Cheyne Court, 4 miles from Lydd, and 5 miles from the coast.

These several trial trips of the new balloon were made, and it had gradually become gas-tight, and capable of any work required, when at Leicester, I regret to say, it was destroyed with all its appurtenances.

One would scarcely believe it possible that such an act could take place in the centre of England in the present day, but it was so destroyed, and effectually stopped all the prearranged experiments. The Mayor of Leicester has presided over meetings for the purpose of collecting subscriptions to assist Mr. Coxwell to rebuild a new balloon, which I hope will help to remove the stigma now resting upon Leicester; and I trust the Foresters will also help to remove the stain now resting upon them; for if not the act of the Foresters themselves, it was at one of their gatherings, under their superintendence, and the destruction of the balloon was not, so far as I can learn, attempted to be stopped by those Foresters present.

Mr. Coxwell then had recourse to the old balloon, which he had repaired as best he could, and the next and last ascent of which I have to speak took place.

Ascent from the Crystal Palace, August 29, 1864.—At $4^h\,6^m\,30^s$ the balloon rose from the Crystal Palace, passing the first 3000 feet in 4 minutes, after which it did not rise so rapidly. At $4^h\,36^m$, at the height of 11,000 feet, it was over Lewisham; at $4^h\,42^m$ nearly stationary; over Charlton at $4^h\,46^m$, and Woolwich at $4^h\,50^m$ when at the height of 13,500 feet. It then began to descend; was over Erith at $5^h\,9^m$, moving quickly, crossed over the river at $5^h\,18^m$, and reached the ground at $6^h\,32^m$ at Wybridge, near Rainham, in Essex.

§ 3. Description of the Table of Observations.

All the meteorological observations taken during the ascents are contained in Table I.

Column 1 contains the times at which the observations were made. Column 2 contains observations of the siphon barometer corrected for temperature and index error. Column 3 contains the readings of the thermometer attached to the barometer. Column 4 contains the readings of an aneroid barometer. Column 5 contains the height above the level of the sea, as reduced from the barometric readings in column 2 on the days the siphon barometer was used, and from column 4 on other days, by the formula of Baily, checked at intervals by that of Laplace, which is as follows:—

$$Z=\log\left(\frac{h}{h'}\right)\times 60159\left(1+\frac{t+t'-64}{900}\right)\left(1+0\cdot002837\cos 2\,\mathrm{L}\right)\left(1+\frac{z+52251}{20886900}\right),$$

where Z is the height required, and h, h', t and t' the height of the barometer corrected for temperature, and the temperature of the air at the lower and upper stations respectively, L the latitude. The temperature of the air for the position of the balloon has been derived from the readings in column 10, when such have been taken, otherwise from column 6. Columns 6 to 9 contain the observations with the dry- and wet-bulb thermometers free, and the deduced dew-point. Column 10 contains the readings of a gridiron thermometer. Columns 11 to 14 contain the observations with the dry- and wet-bulb thermometers aspirated, and the deduced dew-point. Columns 15 and 16 contain the direct dew-point observations with Daniell's and Regnault's hygrometers. When numbers are entered in columns 15 and 16 with "no dew" affixed to them, it is meant that the temperature of the hygrometer has been lowered to the degree stated, but that no dew has been deposited. Column 17 contains the readings of a very delicate blackened bulb thermometer fully exposed to the sun's rays.

The Astronomer Royal had observations made every 10 minutes at the Royal Observatory, Greenwich, on five days of ascents; Lord Wrottesley had observations made by Mr. Hough at Wrottesley Observatory on the ascent from Wolverhampton; E. J. Lowe, Esq., had observations made at Beeston Observatory for the ascents at Wolverhampton and Derby; and observations were made at my house at Blackheath by Messrs. Yair and Howe on June 27 and August 29.

In calculating the height of the balloon, the observations made at the Philosophical Society's Rooms, Newcastle, have been employed for August 31; those at Wrottesley for September 29; those at the Royal Observatory for October 9, 1863, January 12, April 6, June 13, and June 27, 1864; those at Nottingham for June 20; and those at Blackheath for August 29, 1864.

The height of Greenwich above the mean sea-level=159 feet.

The height of Wrottesley above the mean sea-level=531 feet.

The height of Newcastle above the mean sea-level=121 feet.

The height of Nottingham above the mean sea-level=174 feet.

The height of Blackheath above the mean sea-level=160 feet.

Table I.—Meteorological Observations made in the Fourteenth Balloon Ascent, from Newcastle, August 31, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Ther-mometers (free). Dry.	Dry and Wet Ther-mometers (free). Wet.
	h m s	in.	°	in.	feet.	°	°
	6 0 0 p.m.	29·70	......	......		64·0	60·0
	6 6 0 ,,	29·70	......	......	ground	64·0	60·0
	6 7 0 ,,	29·70	......	......		64·0	60·0
(1)	6 12 0 ,,	29·55	......	......	196	56·0	54·0
(2)	6 13 0 ,,	29·30	......	......	422	56·0	53·5
(3)	6 13 30 ,,	......	......	......	(650)		
(4)	6 13 40 ,,						
	6 14 0 ,,	28·80	......	......	874	55·5	53·0
	6 14 20 ,,	28·64	......	......	1,109	54·2	52·1
(5)	6 14 30 ,,	28·50	......	......	1,145	53·5	51·2
(6)	6 14 40 ,,	......	......	......	(1,262)		
(7)	6 15 0 ,,	......	......	......	(1,496)		
(8)	6 15 40 ,,	27·70	......	......	1,963	51·5	49·0
	6 16 0 ,,	27·40	......	......	2,270	50·5	48·5
	6 17 0 ,,	27·00	......	......	2,670	50·5	47·2
(9)	6 17 40 ,,	......	......	......	(2,737)		
	6 18 0 ,,	26·90	......	......	2,770	47·8	45·1
	6 18 30 ,,	26·42	......	......	3,263	47·2	44·0
	6 18 40 ,,	26·00	......	......	3,694	46·0	42·1
	6 18 50 ,,	25·92	......	......	3,778	45·2	41·1
	6 19 0 ,,	25·55	......	......	4,167	45·2	40·5
	6 20 0 ,,	25·30	......	......	4,425	45·0	40·5
	6 20 20 ,,	25·10	......	......	4,632	43·5	38·8
(10)	6 20 30 ,,	24·85	......	......	4,907	43·0	38·2
	6 20 40 ,,	24·48	......	......	5,403	42·0	37·1
	6 21 10 ,,	24·00	......	......	5,844	40·0	35·5
(11)	6 21 30 ,,	23·50	......	......	6,404	37·0	32·5
	6 22 0 ,,	23·30	......	......	6,627	35·5	30·5
	6 22 30 ,,	23·00	......	......	6,963	35·0	29·0
	6 23 0 ,,	22·95	......	......	7,022	34·5	29·0
(12)	6 23 30 ,,	22·90	......	......	7,080	34·0	28·5
	6 24 0 ,,	22·70	......	......	7,315	34·0	28·7
	6 24 10 ,,	22·65	......	......	7,374	33·9	28·5
	6 25 0 ,,	22·50	......	......	7,549	33·5	27·8
(13)	6 25 40 ,,	......	......	......	(7,629)		
(14)	6 27 0 ,,	22·30	......	......	7,790	34·0	28·5
	6 27 50 ,,	22·30	......	......	7,790	34·0	28·5
	6 28 0 ,,	22·20	......	......	7,912	34·0	28·5
	6 28 30 ,,	22·20	......	......	7,912	34·0	28·5
	6 29 0 ,,	22·20	......	......	7,912	34·0	28·5
1.		2.	3.	4.	5.	6.	7.

Time.	Dry and Wet Ther-mometers (free). Diff.	Dry and Wet Ther-mometers (free). Dew-point.	Gridiron Thermo-meter.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened Bulb Ther-mometer.
h m s	°	°	°	°	°	°	°	°	°	°
6 0 0 p.m.	4·0	56·7	64·0	......	......	......	......	57·0		
6 6 0 ,,	4·0	56·7	64·0							
6 7 0 ,,	4·0	56·7	63·8							
6 12 0 ,,	2·0	52·1								
6 13 0 ,,	2·5	51·1								
6 13 30 ,,										
6 13 40 ,,										
6 14 0 ,,	2·5	50·6								
6 14 20 ,,	2·1	50·0								
6 14 30 ,,	2·3	48·5	53·5							
6 14 40 ,,										
6 15 0 ,,										
6 15 40 ,,	2·5	46·4	......	......	......	......	......	......	......	52·0
6 16 0 ,,	2·0	46·4	......	......	......	......	......	48·0		
6 17 0 ,,	3·3	43·7								
6 17 40 ,,										
6 18 0 ,,	2·7	42·3	47·8							
6 18 30 ,,	3·2	40·4	......	......	......	......	......	45·0		
6 18 40 ,,	3·9	37·6								
6 18 50 ,,	4·1	36·4								
6 19 0 ,,	4·7	35·0	......	......	......	......	......	......	......	46·0
6 20 0 ,,	4·5	35·3								
6 20 20 ,,	4·7	33·7	......	......	......	......	......	34·0		
6 20 30 ,,	4·8	32·4								
6 20 40 ,,	4·9	31·1	......	......	......	......	......	......	......	42·5
6 21 10 ,,	4·5	29·6	40·0	......	......	......	......	30·0		
6 21 30 ,,	4·5	26·1								
6 22 0 ,,	5·0	22·5	......	......	......	......	......	25·0		
6 22 30 ,,	6·0	19·4								
6 23 0 ,,	5·5	19·3								
6 23 30 ,,	5·5	18·0								
6 24 0 ,,	5·3	19·4	......	......	......	......	......	......	......	37·0
6 24 10 ,,	5·4	19·0	34·0	......	......	......	......	22·0		
6 25 0 ,,	5·7	17·1								
6 25 40 ,,										
6 27 0 ,,	5·5	18·8								
6 27 50 ,,	5·5	18·8								
6 28 0 ,,	5·5	18·8	......	......	......	......	......	19·5		
6 28 30 ,,	5·5	18·8	34·0	......	......	......	......	20·0		
6 29 0 ,,	5·5	18·8								
1.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

Notes and General Remarks.

(1) Left the earth a few seconds earlier.
(2) Over suburbs of Newcastle.
(3) Heard people shouting.
(4) Over Manors railway station.
(5) Entering cloud.
(6) Above clouds.
(7) Over the Tyne; cumulus below in detached masses.
(8) Tynemouth very clear; cumulus and scud far below; sun shining beautifully on the balloon; over Newcastle; lower clouds moving apparently faster than we are; railway whistle heard; can see an island in the Tyne higher up than Newcastle; hear loud buzzing noise.
(9) Passing over the High Level Bridge. Can see masts of ships in Tyne; cumulus in white heaps on our level; sun shining on some clouds and not on others; can see fields and houses through distant break in clouds; gas cloudy.
(10) No ozone; cumulus in beautiful hills. Over Gateshead; balloon full; cirrocumulus above us at angles of 45° and 75°; cumulus far above, the same as on July 21st, 1862.
(11) Cirrus above; balloon quite full; gas coming out; opened valve; Tyne visible almost to its source; clouds piled up in heaps around, above, and below us, peak upon peak; a very dark cloud with a little blue in it.
(12) Wind blowing in our faces; clouds piled up in heaps around us; blue sky above us; opened valve.
(13) Undoing the grapnel; cirrus, cirrocumulus, and a blackish-brown stratus above; clouds of all shapes and sizes; masses of cumulus in distorted forms.
(14) Let grapnel down; can see Newcastle.

Table I.—Meteorological Observations made in the Fourteenth Balloon Ascent, from Newcastle, August 31, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.
	h m s	in.	°	in.	feet.	°	°
	6 29 30 p.m.	22·10	......	......	8,033	34·0	28·5
(1)	6 29 50 ,,	......	......	......	(8,033)		
	6 31 0 ,,	22·10	......	......	8,033	34·0	28·5
	6 32 0 ,,	22·20	......	......	7,912	34·0	28·5
(2)	6 32 30 ,,	22·20	......	......	7,912	34·0	28·5
	6 33 0 ,,	22·35	......	......	7,770	35·0	30·0
(3)	6 33 30 ,,	......	......	......	(7,696)		
	6 34 0 ,,	22·45	......	......	7,621	36·0	32·0
(4)	6 35 0 ,,	......	......	......	(7,480)		
	6 35 30 ,,	22·70	......	......	7,327	36·5	32·0
	6 36 0 ,,	22·90	......	......	7,124	37·2	33·1
(5)	6 37 0 ,,	23·00	......	......	7,022	38·0	33·5
	6 37 10 ,,	......	......	......	(6,980)		
(6)	6 37 30 ,,	23·10	......	......	6,898	38·5	34·2
(7)	6 38 30 ,,	23·32	......	......	6,626	38·3	34·2
	6 39 0 ,,	23·50	......	......	6,404	38·2	34·2
	6 40 0 ,,	23·65	......	......	6,233	38·5	34·2
	6 40 10 ,,	23·70	......	......	6,176	38·5	34·5
	6 42 0 ,,	23·95	......	......	5,891	38·2	35·1
	6 42 30 ,,	24·40	......	......	5,389	38·5	35·0
(8)	6 43 0 ,,	24·40	......	......	5,389	38·5	35·0
	6 43 30 ,,	24·55	......	......	5,235	38·5	34·8
(9)	6 44 20 ,,	......	......	......	(4,927)		
(10)	6 44 30 ,,	24·92	......	......	4,865	39·0	36·1
(11)	6 45 0 ,,	25·00	......	......	4,784	39·5	37·2
(12)	6 45 30 ,,	25·30	......	......	4,452	39·5	37·1
(13)	6 46 0 ,,	25·50	......	......	4,231	40·5	37·8
(14)	6 46 15 ,,	25·70	......	......	4,009	41·5	38·5
(15)	6 47 0 ,,	25·90	......	......	3,787	42·1	40·5
(16)	6 47 10 ,,	......	......	......	(3,685)		
	6 47 30 ,,	26·20	......	......	3,480	42·1	40·8
	6 48 0 ,,	26·41	......	......	3,264	42·8	41·2
	6 48 10 ,,	26·65	......	......	3,018	43·1	42·8
(17)	6 48 20 ,,	26·71	......	......	2,957	43·8	42·1
(18)	6 48 30 ,,	......	......	......	(2,908)		
	6 49 0 ,,	26·90	......	......	2,762	44·1	43·0
	6 49 30 ,,	27·20	......	......	2,466	45·2	44·1
	6 49 45 ,,	27·35	......	......	2,317	45·2	45·0
	1.	2.	3.	4.	5.	6.	7.

Time.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened Bulb Thermometer.
h m s	°	°	°	°	°	°	°	°	°	°
6 29 30 p.m.	5·5	18·8								
6 29 50 ,,										
6 31 0 ,,	5·5	18·8								
6 32 0 ,,	5·5	18·8	......	......	......	......	......	19·5	......	37·0
6 32 30 ,,	5·5	18·8								
6 33 0 ,,	5·0	22·0								
6 33 30 ,,										
6 34 0 ,,	4·0	26·0	......	......	......	......	......	......	......	39·0
6 35 0 ,,										
6 35 30 ,,	3·5	25·3								
6 36 0 ,,	4·1	27·3								
6 37 0 ,,	4·5	27·4	38·0	......	......	......	......	28·0	......	39·0
6 37 10 ,,										
6 37 30 ,,	4·3	28·4	......	......	......	......	......	......	......	38·2
6 38 30 ,,	4·1	28·6								
6 39 0 ,,	4·0	28·8								
6 40 0 ,,	4·3	28·4								
6 40 10 ,,	4·0	29·0								
6 42 0 ,,	3·1	31·0	......	......	......	......	......	31·5		
6 42 30 ,,	3·5	30·3	......	......	......	......	......	......	......	39·0
6 43 0 ,,	3·5	30·3								
6 43 30 ,,	3·7	29·8								
6 44 20 ,,										
6 44 30 ,,	2·9	32·2	39·2							
6 45 0 ,,	2·3	34·3								
6 45 30 ,,	2·4	34·0								
6 46 0 ,,	2·7	34·8								
6 46 15 ,,	3·0	33·7	41·6	......	......	......	......	35·0	......	42·0
6 47 0 ,,	1·6	38·5								
6 47 10 ,,										
6 47 30 ,,	1·3	39·2	......	......	......	......	......	......	......	42·5
6 48 0 ,,	1·6	40·9								
6 48 10 ,,	0·3	42·4								
6 48 20 ,,	1·7	40·3								
6 48 30 ,,										
6 49 0 ,,	1·1	41·7								
6 49 30 ,,	1·1	42·8	45·4	......	......	......	......	43·0		
6 49 45 ,,	0·2	44·8								
	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Cricket ground at Newcastle, the place we left, visible; rainbow seen between lower cumulus and upper clouds; sense of warmth; small patches of cirrus.

(2) Can see rainbow again; over cumulus in rocky heaps; sun shining on us; can see Newcastle through break in clouds. Colour of clouds opposite to the sun: Top (1) brown stratus; (2) bluish-black stratus; (3) darker bluish-black stratus; (4) thin layer of white cumulostratus; (5) greenish-brown stratus; (6) uniform rocky clouds forming the base of everything. (3) Blue sky above; wind felt in our face.

(4) Uniform rocky clouds below us. Colour of clouds under the sun: Top (1) brown stratus; (2) dark-blue stratus; (3) whitish-greyish black stratus; (4) uniform rocky cumulus.

(5) Perfectly quiet; cumuli visible, apparently resting on the earth. Colour of clouds opposite to the sun: Top (1) brown stratus; (2) bluish-brown stratus; (3) rocky brown cumulostratus; (4) bluish-black stratus; (5) uniform base of rocky cumulus.

(6) Losing sight of the sun; beautiful gilded edge of clouds visible; travelling along over a line of railway in the direction of Durham; wind gentle; no ozone; can see fields with sheaves of corn through a break in the clouds.

(7) Edge of cumulus and brownish cloud tinged by the sun. The tops of the peaks of the rocky clouds on nearly the same level as ourselves; saw struggling bits of cloud between the upper and lower stratum.

(8) Peaks after peaks of cloud (apparently) rising up on every side so much as to greatly confine the view; car hanging rather on one side; cloud with a little red in it, not opposite to the sun. (9) Gas clearing; valve faintly seen.

(10) In basin of clouds; higher on three sides than on the fourth.

(11) Gas clearer; netting visible. (12) Getting into cloud.

(13) Clouds appear to be rising. (14) In basin of cloud; misty.

(15) In cloud; gas clearer still, but not quite clear.

(16) In white mist or cloud; blue above; can see earth clearly, with the river; over a railway; can see two trains.

(17) Over heaps of smoking lime; can see Lambdon Castle with its woods; scaffolding poles visible surrounding it.

(18) Heavy leaden sky above; layers of detached clouds below.

Table I.—Meteorological Observations made in the Fourteenth Balloon Ascent, from Newcastle, August 31, 1863.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	6 50 0 p.m.	......	......	......	(2,061)												
(2)	6 50 10 „	27·78	......	......	1,891	46·8	46·2	0·6	45·4	......	......	......	......	......	45·0		
	6 51 0 „	27·95	......	......	1,724	47·2	46·8	0·4	46·3								
	6 51 10 „	28·25	......	......	1,434	47·8	47·0	0·8	46·1	48·0							
	6 51 30 „	28·50	......	......	1,193	48·2	47·5	0·7	46·7	......	......	......	......	......	......	......	48·5
	6 52 0 „	28·70	......	......	1,003	49·0	48·2	0·8	47·3								
(3)	6 53 0 „	28·85	......	......	859	49·8	49·0	0·8	48·1								
	6 53 10 „	28·90	......	......	812	......	......	......	.. ...	......	......	......	......	......	48·0		
	6 53 20 „	28·90	......	......	812	50·5	50·0	0·5	45·5	50·5							
	6 53 30 „	28·75	......	......	1,050	51·0	50·0	1·0	49·0								
(4)	6 54 0 „	28·40	......	......	1,287	51·0	50·5	0·5	50·0	......	......	......	......	......	50·0		
(5)	6 54 10 „	28·10	......	......	1,580	50·5	50·5	0·0	50·5								
	6 54 20 „	27·90	......	......	1,775	50·5	49·8	0·7	48·2	......	......	......	......	......	49·0		
	6 54 30 „	27·72	......	......	1,954	50·5	48·9	1·6	47·2								
(6)	6 55 0 „	27·65	......	......	2,024	49·8	48·5	1·3	47·1								
	6 55 30 „	27·68	......	......	1,995	50·0	48·0	2·0	45·9	......	......	......	......	......	46·5	......	51·0
(7)	6 56 0 „	......	......	......	(1,793)												
(8)	6 56 30 „	......	......	......	(1,597)												
(9)	6 57 30 „	28·50	......	......	1,200	50·5	50·0	0·5	49·5	......	......	......	......	......	50·0		
	6 58 0 „	28·53	......	......	1,171	50·5	50·0	0·5	49·5	......	......	......	......	......	50·0		
	6 58 30 „	28·80	......	......	909	51·0	50·0	1·0	49·0								
(10)	6 59 0 „	28·90	......	......	840	53·0	52·5	0·5	52·0								
(11)	6 59 30 „	29·10	......	......	704	53·2	52·4	0·8	51·6	......	......	......	......	......	51·0		
(12)	7 0 0 „	29·20	......	......	635	53·5	52·5	1·0	51·5								
	7 1 0 „	29·25	......	......	600	53·7	52·5	1·2	51·3								
	7 3 0 „	29·35	......	......	531	53·8											
(13)	7 5 0 „				ground												
	7 15 0 „	......	......	......	ground	53·5											
	7 29 0 „	......	......	......	ground	53·5											

Meteorological Observations made in the Fifteenth Balloon Ascent, from Wolverhampton, September 29, 1863.

References to Notes.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
	6 0 0 a.m.	......	......	29·58	ground.												
	7 12 0 „	29·436	56·5	......	ground.	44·2	43·8	0·4	43·4	44·6	44·5	43·5	1·0	42·4	43·5		
	7 33 0 „	29·427	......	29·55	ground.	47·2	46·0	1·2	44·7								
(14)	7 36 0 „	29·459	......	29·55	ground.	47·5	45·5	2·0	43·4								
	7 42 0 „	29·483	......	29·55	ground.	48·0	46·1	1·9	44·1	48·0							
	7 43 0 „	29·176	......	......	731	47·0	45·1	1·9	43·0								
	7 45 0 „	29·018	......	......	879	46·0	44·2	1·8	42·2								
(15)	7 46 0 „	28·791	......	28·85	1,092	45·2	44·1	1·1	42·9								
	7 46 30 „	28·644	......	28·72	1,270	45·1	43·8	1·3	41·2								
(16)	7 47 0 „	28·247	......	28·30	1,853	45·1	43·0	2·1	40·7	45·2							

(1) A uniform stratum of cloud above. (2) Can see Castle clearly; sheep visible.
(3) Gas clearing; over thin wood; can see small village or hamlet.
(4) In clouds; valve opened; can see the sky, of a greenish colour.
(5) Above clouds. Colour of clouds: Top (1) deep greenish blue; (2) bluish black; (3) green rocky clouds; (4) slightly rocky clouds. (6) In clouds again.
(7) In clouds; descending rapidly; cannot see earth.
(8) Descending slowly; profound silence; in white mist; gas beautifully clear.

(9) Can see earth faintly; can hear children's voices; can see furnaces and tramways; Durham Minster in sight on a hill; Leamside Junction visible.
(10) Going towards hills beyond Leamside. (11) Crossed the North-Eastern Railway.
(12) Over tramway. (13) On the ground near Pittington.
(14) Cloudy sky; wind S.W.
(15) Misty all round; east clearest.
(16) Can see the top of a high hill; query the Wrekin.

Table I.—Meteorological Observations made in the Fifteenth Balloon Ascent, from Wolverhampton, September 29, 1863.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	7 47 50 a.m.	28·049	49·0	......	2,129	44·9	43·0	1·9	40·8	......	......	......	......	......	41·0		
	7 50 0 „	27·849	49·0	......	2,197	44·8	43·0	1·8	40·9	......	45·0	43·0	2·0	40·7			
(2)	7 52 0 „	26·950	49·0	27·00	2,870	42·0	41·1	0·9	40·0	......	......	......	......	......	......	......	43·0
	7 52 30 „	26·451	49·0	26·50	3,278	41·5	39·0	2·5	35·9	41·5	......	......	......	......	35·5		
	7 54 0 „	26·154	48·0	26·20	3,685	40·0	37·5	2·5	34·2						[no dew.		
(3)	7 55 0 „	......	......	......	(3,811)	38·5	36·5	2·0	33·7	......	......	......	......	......	38·0		
	7 56 0 „	25·859	46·0	......	3,938	38·0	35·8	2·2	32·8								
(4)	7 57 0 „	......	......	25·70	(4,398)	37·5	35·0	2·5	31·6	37·5	37·5	35·2	2·3	32·1			
(5)	7 59 0 „	24·619	42·5	24·75	5,314	35·2	32·2	3·0	27·5	......	......	......	......	......	......	......	36·0
(6)	8 0 0 „	24·469	42·5	24·42	5,473	33·8	31·1	2·7	28·6	......	......	......	......	......	......	......	34·2
(7)	8 1 0 „	24·270	42·0	......	5,789	33·0	30·4	2·6	25·2	......	......	......	......	......	26·0		
(8)	8 2 0 „	23·972	......	24·00	6,000	32·2	29·8	2·4	24·4								
(9)	8 2 30 „	23·873	41·0														
(10)	8 3 0 „	23·783	......	23·81	6,117	31·5	29·0	2·5	22·9	......	......	......	......	......	......	......	32·0
(11)	8 4 0 „	23·674	40·5	......	6,321	31·3	......	......	......	......	......	......	......	......	......	......	31·8
(12)	8 4 30 „	......	......	......	(6,375)	31·0	29·2	1·8	24·3								
(13)	8 5 0 „	23·496	40·0	23·52	6,429	30·5	29·0	1·5	25·9	......	......	......	......	......	26·5	......	31·5
(14)	8 6 0 „	23·528	......	23·55	6,385	30·0	28·5	1·5	23·8	......	......	......	......	......	......	......	31·0
(15)	8 6 30 „	23·529	39·0	......	6,385	30·5	28·7	1·8	25·7								
(16)	8 7 0 „	23·531	......	23·55	6,385	29·0	27·8	1·2	23·4	......	......	......	......	......	21·0		
(17)	8 8 0 „																
(18)	8 9 0 „	23·382	37·0	23·40	6,647	29·5	27·8	1·7	24·7	......	......	......	......	......	21·0		
(19)	8 10 0 „	23·362	37·0	......	6,659	29·3	27·5	1·8	21·3	29·5							
	8 11 0 „	23·103	36·5	23·12	6,966	29·0	27·1	1·9	20·2	......	......	......	......	......	20·5		
(20)	8 11 30 „	22·884	36·0	22·85	7,201	28·5	26·0	2·5	19·2	......	......	......	......	......	......	......	29·2
(21)	8 12 0 „	22·734	36·0	......	7,436	28·0	25·7	2·3	16·2								
(22)	8 13 0 „	22·485	36·0	22·50	7,671	27·2	25·0	2·2	15·2	......	......	......	......	......	......	......	28·1
(23)	8 14 0 „	22·387	35·0	......	7,806	26·0	24·1	1·9	14·4								
	8 15 0 „	22·188	34·5	......	8,024	26·0	24·0	2·0	13·8	26·2							
(24)	8 16 0 „	22·109	34·0	22·12	8,041	26·0	24·0	2·0	13·8	......	......	......	......	......	15·0		
(25)	8 18 0 „	21·999	......	22·01	8,259	27·0	25·1	1·9	16·4	......	27·0	24·8	2·2	14·7			
	8 19 0 „	21·909	......	......	8,364	26·5	24·8	1·7	16·7								
(26)	8 20 0 „	21·840	34·0	21·85	8,446	26·2	24·8	1·4	17·9	......	26·5	24·6	1·9	15·5	......	......	27·2
	8 20 30 „	......	......	......	(8,475)	......	......	......	......	......	......	......	......	......	15·0		
(27)	8 21 0 „	21·790	......	......	8,504	25·0	32·0										
(28)	8 21 30 „	21·690	33·5	......	8,621	25·0	32·0										
(29)	8 22 0 „	21·590	33·0	21·50	8,726	24·5	32·0	......	......	25·0							
(30)	8 22 30 „	......	......	......	(8,726)	......	......	......	......	......	......	......	......	......	15·5		
	8 23 0 „	21·511	33·0	21·48	8,819	23·5	......	......	......	24·0							
(31)	8 24 0 „	21·192	......	......	9,193	21·5											
(32)	8 25 0 „	21·142	33·5	......	9,252	21·3											
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Assisted Mr. Coxwell in lowering the grapnel.
(2) Sun faint. (3) Misty over the earth.
(4) The sun is not visible. (5) The lines from B to G visible; sky spectrum.
(6) Jerks in the balloon; the line F is beautifully defined; cannot see A, and can just see G; sky spectrum.
(7) No ozone by paper. (8) No sun; no ozone by powder.
(9) Mist in straight lines in places, and spread out in other places; very misty on the earth everywhere. (10) Valve opened. (11) Gas cloudy.
(12) Clouds above and below. (13) Clouds very high above us.
(14) B to G; sky spectrum. (15) Sand out.
(16) Fine view to the E.; no sun. (17) Gas heavy; sand out.
(18) Gleam of light.
(19) Balloon is quite full, and on examination appeared to be quite sound.
(20) Faint gleams of light. (21) Cannot get any dew on Regnault's hygrometer.
(22) Gun heard. (23) Over a town; can see two spires.
(24) Apparently moving more south.
(25) Dense clouds above us, very high indeed; there are two layers below us.
(26) A very winding canal. (27) Temperature of gas 29°·0 in neck of balloon.
(28) Temperature of gas in balloon 29½°. (29) Gas clearing a little.
(30) No sun here, but is shining on the landscape over a large space about 30 miles distant, which appears very bright in contrast with all around.
(31) Many clouds apparently on the ground; twelve cumuli in a patch.
(32) Detached cumuli apparently resting on the ground, like huge swans in some places, in others as if there had been a simultaneous discharge of heavy ordnance; three distinct layers of cloud.

Table I.—Meteorological Observations made in the Fifteenth Balloon Ascent, from Wolverhampton, September 29, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened Bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	8 27 0 ,,	21·090	34·0	21·00	9,310	21·0	......	......	......	21·2							
(2)	8 28 0 ,,	20·895	31·0	20·90	9,563	21·5	21·5	......	......	......	......	......	......	......	......	......	23·0
	8 29 30 ,,	20·547	30·0	......	10,005	21·1	18·5	2·6	0·7								
(3)	8 30 0 ,,	......	......	......	(10,300)	......	......	......	......	......	......	......	......	......	5·0		
(4)	8 32 0 ,,	20·002	27·5	20·00	10,646	18·1	14·2	3·9	−14·0	......	......	......	......	......	......	......	18·4
	8 33 0 ,,	19·902	27·3	19·90	10,785	17·2	14·1	3·1	− 9·4								
	8 34 0 ,,	19·802	27·2	......	10,924	17·0	13·9	3·1	− 9·7	17·2							
(5)	8 34 40 ,,	......	......	......	(11,082)												
(6)	8 35 0 ,,	19·702	27·2	19·70	11,062	17·5	14·2	3·3	−10·9	17·5							
	8 36 0 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	6·0		
	8 37 0 ,,	......	......	......	(11,075)	17·5	14·1	3·4	−11·8								
	8 38 0 ,,	19·552	26·8	......	11,082	16·2	14·1	2·1	− 2·0								
	8 39 0 ,,	19·523	26·0	......	11,127	16·5	14·2	2·3	− 3·4								
(7)	8 40 0 ,,	19·303	......	19·30	11,592	16·2	14·0	2·2	− 2·7	......	......	......	......	......	2·5		
(8)	8 41 0 ,,	19·253	26·0	......	11,654	16·0	14·0	2·0	− 1·4	......	......	......	......	......	3·0		
(9)	8 42 0 ,,	19·105	......	19·10	11,857	16·0	14·0	2·0	− 1·4	16·0							
	8 43 0 ,,	18·905	......	......	12,113	15·5	14·8	0·7	9·5								
(10)	8 44 0 ,,	18·756	......	18·70	12,305	13·8	12·5	1·3	2·4								
(11)	8 44 30 ,,	18·705	......	......	12,416	12·2	11·5	0·7	6·1	......	......	......	......	......	5·0	......	12·5
(12)	8 45 0 ,,	18·705	......	......	12,416	13·0	12·1	0·9	5·0								
	8 46 0 ,,	......	......	......	(12,415)	......	......	......	......	......	......	......	......	......	7·0		
(13)	8 46 30 ,,	......	......	......	(12,415)												
	8 47 0 ,,	18·706	24·5	18·70	12,414	14·2	......	......	......	......	......	......	......	......	......	......	16·5
	8 48 0 ,,	18·606	24·5	18·60	12,800	13·0											
	8 48 30 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	4·5	......	17·0
(14)	8 49 0 ,,	18·506	24·5	......	12,857	16·2	15·0	1·2	5·8	......	......	......	......	......	......	......	16·2
	8 50 0 ,,	18·507	24·0	18·50	12,857												
(15)	8 51 0 ,,	18·307	24·0	......	12,972	16·0											
	8 52 0 ,,	18·357	24·0	......	12,900	16·0	......	......	......	16·0							
(16)	8 52 30 ,,	......	......	......	(12,800)	......	......	......	......	......	......	......	......	......	13·5		
	8 53 0 ,,	18·560	......	......	12,666	17·8	......	......	......	......	......	......	......	......	10·5	......	20·0
(17)	8 54 0 ,,	18·633	......	18·62	12,533	17·8	17·0	0·8	11·0	......	......	......	......	......	......	......	19·5
(18)	8 54 30 ,,	18·714	......	......	12,818												
(19)	8 55 0 ,,	......	......	......	12,818	17·5	16·9	0·6	12·5								
(20)	8 57 0 ,,	18·548	18·0	18·50	12,704	17·5	......	......	......	......	......	......	......	......	12·5	......	20·9
(21)	8 58 0 ,,	18·618	......	......	12,593	17·5	16·9	0·6	12·5	......	......	......	......	......	13·0		
	8 59 0 ,,	18·318	......	18·30	12,926	14·0	13·5	0·5	11·5	......	......	......	......	......	13·5		
(22)	9 0 0 ,,	18·318	......	18·30	12,926	11·5	11·5	0·0	11·5	......	......	......	......	......	11·0	......	13·0
	9 1 0 ,,	18·315	......	......	12,926	11·8	11·5	0·3	9·2								
(23)	9 1 15 ,,	......	......	......	12,926	......	......	......	......	......	......	......	......	......	11·1		
(24)	9 1 30 ,,	18·315	......	18·30	12,926	12·5	12·0	0·5	8·1	12·8							
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) A faint sun; the liquid in the actinometer did not move at all; wind below apparently.
(2) A faint sun; examined everywhere with small spectroscope; the spectrum the same as on the earth.
(3) Looks like a beautiful garden at places from 20 to 30 miles distant, upon which the sun is shining brightly; in some places the sun is shining on beautifully curved clouds.
(4) Gleam of sun.
(5) Beautiful bed of clouds; beautiful blue tinge over clouds.
(6) Clouds a mile above us at least.
(7) Passing a large town; query Nottingham or Ashby de la Zouch.
(8) Ozone powders = 4; dotted clouds.
(9) Ice on water.
(10) Moving straight for the Wash.
(11) No sun.
(12) Image of the sun faint.
(13) Gun heard.
(14) Clouds above.
(15) Clouds far above us, at least a mile.
(16) Stratus clouds, some on our level, and some at a higher elevation.
(17) The actinometer reading decreased on exposing the chamber of the instrument.
(18) A very great variety of clouds.
(19) Stratus on our level; sixteen distinct cumuli resting apparently on the earth; like the smoke on discharging ordnance; dark shadow on the ground.
(20) Beautiful tinge of blue.
(21) Seas of white rocky cloud; mist; patches of light on the earth.
(22) Smoke streaming up to a height of 1½ mile; counted forty separate cumuli, apparently resting on the earth.
(23) Gas clear; examined balloon internally for holes or rents.
(24) Gas clear; examined the balloon internally for rents; the dome of the balloon appeared greatly increased in size; does looking through a volume of gas apparently enlarge objects?

TABLE I.—Meteorological Observations made in the Fifteenth Balloon Ascent, from Wolverhampton, September 29, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened Bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	9 2 0 a.m.	18·265	......	......	12,975												
(2)	9 3 0 ,,	18·215	......	18·20	13,025	15·0	14·5	0·5	10·4	......	......	......	......	......	......	......	15·0
(3)	9 4 0 ,,	18·215	......	......	13,025	15·0	14·8	0·2	13·3	......	......	......	......	......	14·0		
(4)	9 5 0 ,,	18·215	......	18·20	13,025	15·0	14·8	0·2	13·3								
(5)	9 7 0 ,,	18·215	......	......	13,030	15·0	......	......	......	......	......	......	......	......	7·2	......	16·5
	9 8 0 ,,	18·215	......	......	13,160	16·0	......	......	......	......	......	......	......	......	......	......	19·0
(6)	9 9 0 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	11·5		
(7)	9 10 0 ,,	18·105	......	......	13,279	15·1	14·5	0·6	9·8	......	......	......	......	......	12·0		
(8)	9 10 30 ,,	18·065	......	......	13,321	15·0	14·5	0·5	10·6								
	9 11 0 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	13·0		
(9)	9 11 15 ,,	......	......	......	(13,602)												
(10)	9 12 0 ,,	17·815	......	......	13,882	14·5	14·0	0·5	10·1	......	......	......	......	......	11·5		
	9 12 30 ,,																
(11)	9 13 0 ,,	17·645	24·0	......	14,218	13·1	......	......	......	......	......	......	......	......	......	......	13·1
(12)	9 14 0 ,,	17·663	24·0	......	14,096	12·8	12·4	0·4	9·3	13·0							
	9 15 0 ,,	17·713	24·0	17·70	13,791	12·2	11·2	1·0	3·5	......	......	......	......	......	11·1	......	12·2
(13)	9 16 0 ,,	17·713	24·0	......	13,805	14·5											
	9 17 0 ,,	......	......	......	......	14·5	27·0										
(14)	9 18 0 ,,																
(15)	9 20 0 ,,	17·613	......	......	13,695	1·0	......	......	......	......	......	......	......	......	0·0		
(16)	9 22 0 ,,	17·613	......	......	13,695	8·0											
(17)	9 23 0 ,,	17·613	......	......	13,695	7·2	......	......	......	......	......	......	......	......	......	......	10·0
(18)	9 24 0 ,,	......	......	......	(13,738)	......	......	......	......	......	......	......	......	......	− 4·0		
(19)	9 25 0 ,,	17·513	......	......	13,982	5·0											
	9 27 0 ,,	17·513	21·0	......	13,982	3·5	......	......	......	......	......	......	......	......	− 7·0		
	9 28 0 ,,	17·643	21·0	......	13,807	3·0	......	......	......	......	......	......	......	......	−10·0	......	6·0
(20)	9 29 0 ,,	17·513	20·0	......	13,982	2·5	2·0	0·5									
	9 31 0 ,,	16·514	19·0	......	15,517	2·0	1·0	......	......	......	......	......	......	......	−10·0	......	4·6
(21)	9 32 0 ,,	16·013	......	......	16,284	1·2	0·2	1·0	......	......	......	......	......	......	−10·0		
(22)	9 33 0 ,,	15·815	18·0	......	16,590	0·0	......	......	......	......	......	......	......	......	......	......	3·0
	9 34 0 ,,	17·317	......	......	14,295												
	9 35 0 ,,	17·417	......	17·30	14,235	4·5	......	......	......	......	......	......	......	......	− 1·2		
	9 36 0 ,,	17·417	......	......	14,219	7·5	......	......	......	......	......	......	......	......	5·0	......	10·0
(23)	9 38 0 ,,	17·517	18·0	17·50	14,175	6·0	5·9	0·1	......	......	......	......	......	......	4·5	......	8·5
(24)	9 40 0 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	4·0		
(25)	9 41 0 ,,	17·417	......	......	14,203	5·5	......	......	......	5·0	......	......	......	......	4·5		
(26)	9 43 0 ,,	17·618	......	17·60	13,897	6·0	4·9	1·1	......	......	......	......	......	......	− 3·0	......	8·5
(27)	9 44 0 ,,	17·618	17·5	......	13,897												
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Shadow of cloud upon mist very fine; earth has a violet colour.
(2) Sun bringing mist up vertically.
(3) The sun was shining; the increase of scale reading in one minute by the actinometer was 5 divisions.
(4) Clouds above; a bright sun; actinometer increased 4 divisions in one minute.
(5) Clouds above us still; the sun was bright; actinometer increased 7 divisions in one minute, and fell 3 divisions in the shade in one minute.
(6) Stratus on our level.
(7) Crossing a river; query Trent.
(8) Sand out; suspect the direction of the wind changed here.
(9) A shrill whistle up the balloon was followed by a ringing sound for 10 seconds, afterwards passing down the balloon.
(10) The air is very nearly saturated; clouds above us still.
(11) Sun shining; spectrum everywhere.
(12) B to G; F very distinct; sky spectrum.
(13) Water applied to Wet-bulb Thermometer; no ozone paper coloured anywhere.
(14) Sun shining on Gridiron Thermometer.
(15) Blue sky; actinometer increased 5 divisions in one minute.
(16) Sun spectrum H clear, dark beyond.
(17) Sun spectrum A clear.
(18) Many lines in sun spectrum.
(19) Lines clear and numerous in the sun spectrum, extending from A to beyond H.
(20) Filled bag with air.
(21) Opened valve, gas expanding rapidly; filled bags with air; saw outline of coast through a break in the clouds from N. of Yarmouth and to the West.
(22) Opened valve.
(23) Sun shining brightly; increase of 7 divisions in the actinometer scale in one minute.
(24) The sun spectrum extended from A to far beyond H, and was very beautiful.
(25) Packed up Regnault's Hygrometer; opened valve; gas expanding rapidly.
(26) Line H in the spectrum clear and vivid; beautiful ring on black bulb of Hygrometer; packed up Dry and Wet aspirated.
(27) The sun spectrum very vivid and very long, H made up of fine lines; moving directly towards the Wash.

Table I.—Meteorological Observations made in the Fifteenth Balloon Ascent, from Wolverhampton, September 29, 1863.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	9 45 0 a.m.	17·468	......	......	14,224	9·0	7·5	1·5	......	......	......	......	......	......	− 3·0		
	9 46 0 ,,	......	......	......	14,190	9·3	8·2	1·1	......	......	......	......	......	......	− 2·0		
(2)	9 47 0 ,,	17·418	......	......	14,155	9·5	8·6	0·9	......	......	......	......	......	......	......	......	12·0
(3)	9 48 0 ,,	17·318	......	17·30	14,308	11·5	11·0	0·5	7·2	11·5	......	......	......	......	8·0		
(4)	9 49 0 ,,	17·518	......	......	14,031	13·0	12·3	0·7	6·9	......	......	......	......	......	8·0	......	17·1
	9 49 30 ,,	......	......	......	......	13·9	13·2	0·7	7·8	......	......	......	......	......	......	......	19·0
	9 50 0 ,,	17·117	......	17·00	13,175	14·1	13·5	0·6	8·9	......	......	......	......	......	......	......	18·9
(5)	9 52 0 ,,	17·117	......	17·10	13,175	15·1	14·1	1·0	6·4	......	......	......	......	......	7·0	......	18·9
	9 54 0 ,,	17·318	......	......	14,459	13·1	12·6	0·5	8·8	......	......	......	......	......	......	......	15·2
	9 55 0 ,,	17·518	......	......	14,347	13·2	12·1	1·1	3·6	......	......	......	......	......	......	......	15·0
(6)	9 56 0 ,,	17·718	......	......	13,947	13·5	11·9	1·6	− 0·5	......	......	......	......	......	0·0	......	17·2
	9 56 30 ,,	......	......	......	(13,947)	13·5	11·0	2·5	− 8·4	13·8							
(7)	9 57 0 ,,	17·718	......	......	13,947	13·2	11·0	2·2	− 6·0	......	......	......	......	......	− 3·0	......	17·5
(8)	9 57 30 ,,	17·818	......	17·80	13,747	13·2	10·5	2·7	−10·4	13·5							
	9 58 0 ,,	18·118	......	......	13,332	14·1	11·0	3·1	−13·0	......	......	......	......	......	......	......	19·0
	9 58 30 ,,																
	9 59 0 ,,	18·619	......	......	12,642	17·0	14·5	2·5	− 4·7	......	......	......	......	......	......	......	21·0
	10 0 0 ,,	18·719	......	18·70	12,504	17·2	15·0	2·2	− 1·7	......	......	......	......	......	− 6·0		
	10 1 0 ,,	18·919	......	......	12,225	17·5	15·0	2·5	− 4·0	17·5							
	10 1 30 ,,	19·069	......	......	12,030	17·2	14·5	2·7	− 6·0								
	10 2 0 ,,	19·210	23·0	19·20	11,834	17·5											
	10 3 0 ,,	......	......	......	(10,964)	19·5	16·1	3·4	− 8·7	20·0	......	......	......	......	−10·0		
(9)	10 3 30 ,,	19·210	......	20·20	10,534	21·0	16·5	4·5	−14·4	......	......	......	......	......	......	......	25·2
	10 4 0 ,,	20·410	......	......	10,284	22·0	17·8	4·2	− 9·9	......	......	......	......	......	......	......	27·0
	10 4 30 ,,	20·660	......	20·65	10,084	23·2	18·1	5·1	−13·9								
(10)	10 5 0 ,,	20·909	24·0	20·90	9,671	23·0	19·0	4·0	− 6·1	......	......	......	......	......	......	......	28·5
	10 5 30 ,,	......	......	......	(9,425)	......	......	......	......	......	......	......	......	......	− 5·0		
	10 6 0 ,,	21·309	......	......	9,179	25·2	20·5	4·7	− 5·5	......	......	......	......	......	......	......	29·5
	10 6 30 ,,	21·509	......	......	8,933	26·0	21·0	5·0	− 4·0	......	......	......	......	......	......	......	30·0
	10 7 0 ,,	21·909	......	21·90	8,439	26·5	21·0	5·5	− 6·9	......	......	......	......	......	− 5·0		
	10 7 30 ,,	22·109	......	......	8,209	27·0	21·1	5·9	− 5·9	......	......	......	......	......	......	......	31·9
	10 8 0 ,,	22·659	......	......	7,626	29·0	24·5	4·5	8·2	29·0							
(11)	10 9 0 ,,	22·809	......	......	7,396	31·0	26·8	4·2	15·5	31·5							
(12)	10 11 0 ,,	24·398	29·5	......	5,613	34·5	30·9	3·6	24·9	......	......	......	......	......	25·0	......	39·0
	10 13 0 ,,	24·888	......	......	5,078	35·2	30·9	4·3	24·1								
	10 13 30 ,,	25·492	......	......	......	36·0	31·1	4·9	23·8	......	......	......	......	......	......	......	39·1
(13)	10 14 0 ,,	......	32·0	25·50	4,438	37·2	31·1	6·1	22·5								
	10 15 0 ,,	25·992	......	......	3,933	39·2	33·0	6·2	24·9								
	10 15 30 ,,	26·391	......	......	3,529	39·5	33·0	6·5	24·6	......	......	......	......	......	25·0		
	10 16 0 ,,	26·689	33·0	......	3,224	41·2	23·5	7·7	23·8	......	......	......	......	......	......	......	49·2
(14)	10 17 0 ,,	27·007	34·0	......	2,828	42·0	33·8	8·2	23·7	......	......	......	......	......	......	......	49·0
	10 19 0 ,,	27·881	......	......	2,039	47·0	37·5	9·5	26·8	......	......	......	......	......	......	......	53·0
(15)	10 19 10 ,,	27·981	......	......	1,881												
	10 20 0 ,,	27·979	......	......	1,881	48·0	40·0	8·0	31·2								
	10 21 0 ,,	27·777	......	......	1,717	48·0	40·5	7·5	32·3								
(16)	10 23 0 ,,	28·471	......	......	1,469	50·0	45·0	5·0	39·7								
(17)	10 30 0 ,,	......	......	......	ground.												
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Gun again heard. (2) Can see 50 miles of coast well.

(3) Supposed to be about 10 miles from the mouth of the Wash; we cannot go higher, but must descend.

(4) An increase of 8 divisions in the reading of the actinometer in one minute, in full rays of the sun.

(5) An increase of 7 divisions in the reading of the actinometer in one minute, in full rays of the sun, and then of 8 divisions in one minute.

(6) Wash obscured by second layer of clouds. (7) No ozone. (8) Ozone powder = 8.

(9) A railway seen. (10) Balloon collapsing. (11) Sun warm.

(12) The readings of the actinometer increased 20 divisions in one minute in full rays of the sun.

(13) Packed up Aneroid Barometer; trees are bending before the wind; there seems to be a gale below.

(14) Packed up Daniell's Hygrometer; the reading of the actinometer increased 25 div. in one minute, and again 25 divisions in one minute; can hear the barking of a dog.

(15) The wind rough.

(16) Packed up all the instruments; on the ground at Temple Bruer, 6 miles from Sleaford. (17) The increase of the actinometer in one minute was 48 divisions

Table I.—Meteorological Observations made in the Sixteenth Balloon Ascent, from the Crystal Palace, October 9, 1863.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	3 0 0 p.m.	......	......	29.34													
	3 30 0 ,,	29.35	......	29.29													
	4 0 0 ,,	......	......	29.30	......	53.8	48.6	5.2	43.5								
(2)	4 5 0 ,,	......	......	......	......	53.0	49.2	3.8	46.0								
	4 27 0 ,,	......	......	29.23	......	54.5	49.2	5.3	44.1								
	4 28 30 ,,	......	......	29.32													
(3)	4 29 0 ,,																
	4 29 30 ,,	......	......	29.12	426	53.0	47.9	5.1	42.8								
	4 30 0 ,,	......	......	28.70	845	52.0	46.8	5.2	41.5								
(4)	4 30 30 ,,	......	......	28.42	899	50.0	45.5	4.5	40.7								
(5)	4 31 0 ,,	......	......	27.92	1,573	48.2	44.1	4.1	39.6								
	4 31 40 ,,	......	......	27.70	1,748	47.8	43.0	4.8	37.7								
	4 31 50 ,,	......	......	27.60	1,887	47.4	42.8	4.6	37.7								
	4 32 0 ,,	......	......	27.50	1,984	46.8	42.5	4.3	37.7								
	4 32 15 ,,	......	......	27.35	2,131	46.0	42.0	4.0	37.4								
(6)	4 32 30 ,,	......	......	27.20	2,279	45.2	41.1	4.1	36.4								
	4 32 45 ,,	......	......	27.08	2,399	44.8	40.5	4.3	35.6								
(7)	4 33 0 ,,	......	......	27.00	2,474	43.5	40.0	3.5	35.9								
(8)	4 33 30 ,,	......	......	26.42	3,060	42.0	38.4	3.6	33.9								
(9)	4 34 0 ,,	......	......	25.80	3,700	41.0	37.2	3.8	32.4								
	4 34 30 ,,	......	......	25.70	3,805	40.8	36.8	4.0	31.8								
	4 35 0 ,,	......	......	25.62	3,878	40.5	36.5	4.0	31.4								
(10)	4 35 30 ,,	......	......	25.40	4,114	39.2	35.6	3.6	30.8								
(11)	4 36 0 ,,	......	......	25.20	4,219	37.5	33.0	4.5	26.8								
(12)	4 37 0 ,,	......	......	......	(5,200)	......	......	......	......	......	......	......	......	......	29.0		
(13)	4 37 30 ,,	......	......	23.95	5,672	34.2	31.5	2.7	26.9								
(14)	4 38 0 ,,	......	......	24.10	5,499	33.0	30.5	2.5	25.5	......	......	......	......	......	......	26.0	
	4 38 30 ,,	......	......	24.00	5,605	32.5	29.7	2.8	23.8								
	4 39 0 ,,	......	......	23.90	5,717	32.0	29.5	2.5	24.2								
(15)	4 39 30 ,,	......	......	23.40	6,277	31.5	28.2	3.3	20.0								
	4 39 45 ,,	......	......	23.31	6,378	31.3	28.4	2.9	21.0								
(16)	4 40 0 ,,	......	......	23.20	6,506	31.2	28.5	2.7	22.3	......	......	......	......	......	......	22.0	
	4 40 30 ,,	......	......	23.10	6,619	31.2	28.5	2.7	21.7								
(17)	4 41 0 ,,	......	......	23.00	6,732	31.0	28.5	2.5	22.2	......	......	......	......	......	22.2		
(18)	4 41 30 ,,	......	......	22.95	6,796	31.5	28.7	2.8	21.8	......	......	......	......	......	......	21.0	
	4 42 0 ,,	......	......	22.75	7,030	31.8	28.9	2.9	22.0								
	4 42 30 ,,																
(19)	4 43 0 ,,	......	......	22.62	7,184	31.0	27.1	3.9	16.9	......	......	......	......	......	......	20.0	
	4 43 30 ,,	......	......	22.60	7,193	30.5	27.1	3.4	17.2								
(20)	4 44 0 ,,	......	......	22.60	7,193	29.5	27.1	2.4	19.1								
(21)	4 45 0 ,,	......	......	22.55	7,252	29.2	27.1	2.1	19.8	......	......	......	......	......	20.0		
(22)	4 46 0 ,,	......	......	22.52	7,303	29.0	27.1	1.9	20.2								
(23)	4 46 30 ,,	......	......	22.50	7,310	30.0	27.1	2.9	18.0	......	......	......	......	......	......	19.0	
(24)	4 47 0 ,,	......	......	22.55	7,267	31.5	27.2	4.3	16.5								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Clear sky generally; fine wind S.E.
(2) Both the Gridiron Thermometer and the Blackened Bulb Thermometer were broken just before leaving.
(3) Left the earth.
(4) A very rapid decline of temperature.
(5) Sky cloudless except near the horizon.
(6) Golden sunset; colours very intense.
(7) Sand out.
(8) Rising quickly.
(9) Wind changed from S.E. to S.
(10) Temperature falling quickly again.
(11) The Thames visible to its mouth.
(12) The mouth of the Thames visible, and surrounding coast.
(13) The sea beyond the mouth of the Thames visible.
(14) Gas like smoke on coming out of the lower valve or neck of balloon.
(15) Over London; the roar of London deep.
(16) Roar of London loud and continuous.
(17) The river Thames like a canal.
(18) London looks very fine indeed.
(19) Nearly over London Bridge.
(20) The sunset is gorgeous; rose-coloured cumuli extending from near the place of the sun to the S. and N.; white cumuli in the E.; no clouds except near the horizon.
(21) The ships in the Thames appear long and narrow, and steamboats like moving toys.
(22) The Docks distinct and very clear.
(23) Can see the inner court of the Bank; St. Paul's looks very small; all streets in the city are distinctly visible; Milbank Prison and Oxford Street seen very clearly.
(24) Over the Thames.

Table I.—Meteorological Observations made in the Sixteenth Balloon Ascent, from the Crystal Palace, October 9, 1863.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	4 48 0 p.m.	......	......	22·69	7,087	30·0	27·2	2·8	18·0								
(2)	4 49 0 „	......	......	23·00	6,731	30·5	27·2	3·3	17·7	......	......	......	......	......	20·0		
(3)	4 50 0 „	......	......	23·15	6,557	31·0	27·5	3·5	18·1								
	4 51 0 „	......	......	23·60	6,310	31·7	28·0	3·7	19·5								
	4 52 30 „	......	......	24·00	5,600	32·0	29·2	2·8	22·7	......	......	......	......	......	......	21·0	
(4)	4 52 45 „	......	......	24·15	5,433	32·5	29·5	3·0	23·1								
	4 53 0 „	......	......	24·50	5,052	33·0	29·8	3·2	23·4	......	......	......	......	......	22·0		
	4 53 30 „	......	......	25·55	3,928	33·2	30·0	3·2	23·6								
	4 54 0 „	......	......	24·70	4,835	34·0	30·5	3·5	24·4								
	4 55 0 „	......	......	25·10	2,409	34·8	30·7	4·1	24·2	......	......	......	......	......	......	24·0	
(5)	4 55 10 „	......	......	25·20	4,302	34·8	31·2	3·6	25·3	......	......	......	......	......	26·0		
	4 56 0 „	......	......	25·40	4,095	35·5	32·0	3·5	26·6								
	4 57 0 „	......	......	25·55	4,024	36·0	32·0	4·0	26·0	......	......	......	......	......	......	26·0	
	4 57 30 „	......	......	25·70	3,783	36·5	32·5	4·0	26·6								
	4 57 45 „	......	......	25·80	3,679	37·0	33·0	4·0	27·3								
	4 58 0 „	......	......	25·80	3,679	37·0	33·0	4·0	27·3	......	......	......	......	......	28·0		
	4 58 30 „	......	......	25·80	3,679	37·0	33·1	3·9	27·5						[dew off.		
	4 59 0 „	......	......	25·85	3,548	37·0	33·2	3·8	27·7	......	......	......	......	......	27·5		
	5 0 0 „	......	......	26·20	3,268	38·0	34·2	3·8	29·0	......	......	......	......	......	......	29·0	
	5 1 0 „	......	......	26·42	3,046	38·7	35·1	3·6	30·3							[dew off.	
	5 1 30 „	......	......	......	(3,043)	......	......	......	......	......	......	......	......	......	......	30·0	
(6)	5 2 0 „	......	......	26·42	3,040	39·0	35·1	3·9	29·9								
(7)	5 3 0 „	......	......	26·40	3,067	39·2	35·5	3·7	30·6								
(8)	5 4 0 „	......	......	26·38	3,087	39·0	35·1	3·9	29·9								
	5 4 30 „	......	......	26·35	3,125	39·2	35·1	4·1	29·6	......	......	......	......	......	25·5		
	5 4 45 „	......	......	......	(3,220)	......	......	......	......	......	......	......	......	......	......	25·0	
	5 5 0 „	......	......	26·15	3,323	39·5	35·5	4·0	30·2								
(9)	5 6 0 „	......	......	26·15	3,330	39·2	35·5	3·7	30·6								
	5 6 30 „	......	......	26·15	3,323	39·5	35·5	4·0	30·2								
(10)	5 7 0 „	......	......	26·20	3,272	39·2	35·1	4·1	29·6	......	......	......	......	......	26·0		
(11)	5 8 0 „	......	......	26·31	3,159	39·0	35·5	3·5	30·8								
(12)	5 10 0 „	......	......	26·60	2,863	39·5	36·0	3·5	31·4								
	5 11 0 „	......	......	26·70	2,765	40·5	36·1	4·4	30·4								
(13)	5 12 0 „	......	......	26·80	2,665	40·5	37·0	3·5	32·5								
(14)	5 13 0 „	......	......	26·75	2,715	41·0	37·8	3·2	33·7								
	5 14 0 „	......	......	27·08	2,386	42·0	38·5	3·5	34·2								
	5 14 15 „	......	......	27·14	2,327	42·0	39·2	2·8	35·7								
	5 14 30 „	......	......	27·14	2,327	42·0	39·0	3·0	35·3								
(15)	5 15 0 „	......	......	27·10	2,369	42·5	39·1	3·4	34·9	......	......	......	......	......	28·5		
	5 16 0 „	......	......	26·85	2,629	42·0	38·5	3·5	34·2								
	5 17 0 „	......	......	26·72	2,750	42·5	38·1	4·4	32·7								
	5 18 0 „	......	......	26·60	2,870	42·0	37·5	4·5	32·0								
	5 19 0 „	......	......	26·55	2,920	41·5	37·0	4·5	31·4								
	5 20 0 „	......	......	26·35	3,121	41·0	36·8	4·2	31·5								
	5 20 30 „	......	......	26·20	3,275	40·7	36·2	4·5	30·2	......	......	......	......	......	28·0		
(16)	5 21 0 „	......	......	26·15	3,323	40·5	36·1	4·4	30·4								
	5 22 0 „	......	......	26·10	3,368	40·0	36·0	4·0	30·8								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Roar of London deep: some blue smoke of London seen curving upward.
(2) Mist towards the S. of London, bounded by straight lines.
(3) All the S. of London is bounded by mist mixed with smoke, all N. of London clear.
(4) Leaving London.
(5) The wet thermometer reading is increasing more rapidly than the dry bulb.
(6) Nearly over Tottenham.
(7) Noise of London still heard.
(8) Beautiful golden sunset.
(9) Changed direction of motion.
(10) A faint spectrum on all sides.
(11) Misty over the land.
(12) Misty; sky blue.
(13) Over New River; two miles from Tottenham.
(14) Entered another current; moving N.W.
(15) Beautiful sunset.
(16) S.E. current.

Table I.—Meteorological Observations made in the Sixteenth Balloon Ascent, from the Crystal Palace, October 9, 1863.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened Bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	5 22 30 p.m.	......	......	26·10	3,368	39·5	36·2	3·3	31·8								
	5 24 0 „	......	......	26·33	3,590	39·5	36·1	3·4	31·6								
(2)	5 25 0 „	......	......	26·40	3,382	39·8	36·5	3·3	32·2								
	5 25 30 „	......	......	26·56	2,905	40·5	36·2	4·3	30·6								
	5 25 45 „	......	......	26·65	2,905	40·5	36·5	4·0	31·4	......	......	......	......	......	31·5		
	5 26 0 „	......	......	26·91	2,554	41·0	37·1	3·9	32·2	......	......	......	......	......	33·5		
	5 27 0 „	......	......	27·05	2,386	41·5	37·8	3·7	33·2	......	......	......	......	......	34·0		
	5 28 0 „	......	......	27·20	2,268	42·0	39·1	2·9	35·5								
	5 29 0 „	......	......	27·40	2,072	43·0	40·5	2·5	37·5	......	......	......	......	......	36·0		
	5 30 0 „	......	......	27·45	2,042	43·0	41·0	2·0	38·6	......	......	......	......	......	38·5		
	5 31 0 „	......	......	27·50	1,976	43·8	41·5	2·3	38·8	......	......	......	......	......	40·0		
	5 31 30 „	......	......	27·50	1,970	44·0	42·1	1·9	39·8								
	5 32 15 „	......	......	27·50	1,958	43·5	42·1	1·4	41·0								
(3)	5 32 30 „	......	......	27·50	1,930	44·0	42·5	1·5	40·7	......	......	......	......	......	40·0		
	5 33 30 „	......	......	27·55	1,890	44·0	42·5	1·5	40·7								
	5 34 0 „	......	......	27·60	1,877	44·0	42·5	1·5	40·7								
	5 34 30 „	......	......	27·65	1,827	44·0	42·5	1·5	40·7	......	......	......	......	......	40·0		
	5 35 0 „	......	......	27·75	1,831	44·5	42·8	1·7	40·7								
	5 35 30 „	......	......	27·85	1,633	44·2	43·1	1·1	41·8								
	5 36 0 „	......	......	27·90	1,586	44·5	43·2	1·3	41·4	......	......	......	......	......	41·0		
	5 36 30 „	......	......	28·00	1,490	44·8	43·6	1·2	42·1								
	5 37 0 „	......	......	27·70	1,782	44·8	43·6	1·2	42·1	......	......	......	......	......	43·0		
	5 38 0 „	......	......	27·55	1,927	45·0	43·4	1·6	41·5								
	5 39 0 „	......	......	27·35	2,120	45·2	43·1	2·1	40·7	......	......	......	......	......	......	41·0	
	5 40 0 „	......	......	27·35	2,124	45·0	43·1	1·9	40·9	......	......	......	......	......	41·0		
	5 41 0 „	......	......	26·92	2,552	44·2	43·0	1·2	41·6								
	5 42 0 „	......	......	26·85	2,619	43·0	41·5	1·5	37·5								
(4)	5 42 15 „	......	......	26·56	2,910	42·5	38·5	4·0	33·5								
	5 42 30 „	......	......	26·30	3,174	41·5	37·5	4·0	32·5								
(5)	5 43 0 „	......	......	26·15	3,326	41·0	37·2	3·8	32·4	......	......	......	......	......	33·0		
	5 43 15 „	......	......	26·00	3,476	39·5	36·0	3·5	31·4								
	5 43 30 „	......	......	25·75	3,735	39·2	35·0	4·2	29·5								
	5 44 0 „	......	......	25·72	3,762	38·5	33·0	5·5	25·6								
	5 45 0 „	......	......	25·30	4,318	37·8	32·5	5·3	34·2								
	5 45 30 „	......	......	25·25	4,259	37·2	35·1	2·1	32·1								
	5 46 0 „	......	......	25·25	4,303	37·2	35·0	2·2	32·0								
	5 46 30 „	......	......	25·00	4,584	37·0	35·2	1·8	32·7								
	5 47 0 „	......	......	24·75	4,786	36·6	32·5	4·1	26·5								
	5 48 0 „	......	......	24·60	4,949	36·0	31·5	4·5	24·7								
	5 48 30 „	......	......	24·50	5,052	36·0	31·5	4·5	24·7								
	5 49 0 „	......	......	24·30	5,263	35·0	31·8	3·2	26·7								
	5 49 30 „	......	......	24·20	5,377	34·2	31·0	3·2	25·4								
	5 49 45 „	......	......	23·80	5,813	33·0	30·8	2·2	26·4								
(6)	5 50 0 „	......	......	23·55	6,091	32·5	28·2	4·3	19·0								
	5 51 0 „	......	......	23·10	6,310	31·2	27·5	3·7	17·6								
	5 52 0 „	......	......	22·75	6,992	29·8											
	5 53 0 „	......	......	22·40	7,305	29·2	25·2	4·0	10·7								
	5 54 0 „	......	......	22·20	7,633	28·5											
	5 55 0 „	......	......	22·10	7,755	28·5	24·5	4·0	9·1								
	5 55 30 „	......	......	21·90	7,988	28·1	24·5	3·6	9·7								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Direction N.W.
(2) The western sky is magnificent; the eastern sky is dotted with fine cumuli.
(3) A thin mist.
(4) Sudden dryness.
(5) Too dark to observe either Daniell's or Regnault's hygrometers after this time.
(6) Earth looks dark.

Table I.—Meteorological Observations made in the Sixteenth Balloon Ascent, from the Crystal Palace, October 9, 1863.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	5 56 0 p.m.	......	......	21·80	8,108	28·0	24·1	3·9	8·1								
(1)	5 56 30 „	......	......	21·60	8,354	28·0	24·0	4·0	7·6								
(2)	5 57 0 „	......	......	21·55	8,416	27·5	23·5	4·0	4·9								
	5 58 0 „	......	......	21·50	8,467	27·0	23·0	4·0	4·6								
	5 59 0 „	......	......	21·40	8,499	27·0	23·0	4·0	4·6								
(3)	6 0 0 „	......	......	21·30	8,714	26·5	23·0	3·5	6·1								
Meteorological Observations made in the Seventeenth Balloon Ascent, from the Royal Arsenal, Woolwich, January 12, 1864.																	
(4)	2 5 0 p.m.	30·110	......	30·11	......	42·0	39·3	2·7	36·0	42·0	......	......	......	......	35·0	......	41·8
(5)	2 6 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	35·0	
(6)	2 7 0 „	......	......	......	......	......	......	......	......	......	41·7	39·2	2·5	36·1	[dew off.		
	2 8 0 „	29·856	45·0	29·90	......	41·5	39·0	2·5	35·9	......	......	......	......	......	36·5		
(7)	2 8 30 „	29·717	45·0	......	368	......	......	......	......	......	......	......	......	......	......	......	40·0
(8)	2 9 0 „	29·409	44·5	......	655	40·0	38·2	1·8	35·9	39·5	......	......	......	......	......	......	39·5
(9)	2 10 0 „	28·679	44·5	......	1,328	38·5	37·2	1·3	35·4								
(10)	2 10 30 „	28·389	44·3	28·42	1,598	39·5	38·1	1·4	36·3								
(11)	2 11 0 „	28·469	44·3	......	1,518	39·7	38·3	1·4	36·4								
(12)	2 11 30 „	28·560	44·0	28·60	1,436	40·0	38·5	1·5	36·6								
	2 12 0 „	28·610	43·7	28·65	1,390	41·5	39·5	2·0	37·1								
	2 12 30 „	28·871	43·5	28·90	1,148	41·5	39·5	2·0	37·1								
	2 13 0 „	28·713	43·0	......	1,336	41·0	39·5	1·5	37·7	40·3	......	......	......	......	......	......	41·0
	2 13 30 „	28·593	43·0	28·60	1,733	41·5	39·5	2·0	37·1								
(13)	2 14 0 „	28·383	43·0	......	1,773	41·7	39·8	1·9	37·4								
(14)	2 15 0 „	28·313	43·0	28·34	1,787	42·0	40·1	1·9	37·7								
(15)	2 15 30 „	28·243	43·0	......	1,801	42·5	40·3	2·2	37·5								
	2 16 0 „	28·163	43·0	......	1,816	43·0	40·5	2·5	37·5	43·6	......	......	......	......	......	......	43·5
	2 16 30 „	......	......	......	(1,860)	......	......	......	......	......	......	......	......	......	39·0		
(16)	2 17 0 „	28·073	43·0	28·11	1,903	43·2	41·0	2·2	38·4								
	2 18 0 „	27·963	43·0	......	2,010	44·0	43·1	0·9	42·0	......	44·0	43·1	0·9	42·0			
(17)	2 19 0 „	27·763	43·0	......	2,204	44·0	41·5	2·5	38·5	......	44·2	42·1	3·1	37·5	......	37·0	
(18)	2 20 0 „	27·314	43·0	......	2,639	44·0	41·2	2·8	37·9	44·0	44·0	41·2	2·8	37·9	......	......	44·0
	2 21 0 „	27·264	43·0	27·31	2,687	44·0	41·1	2·9	37·7	44·0	44·0	41·0	3·0	37·5	......	......	44·0
(19)	2 21 30 „	27·213	44·0	27·25	2,735	44·0	41·2	2·8	37·9	44·1	......	......	......	......	......	......	44·1
(20)	2 23 0 „	27·173	44·0	......	2,775	44·0	41·0	3·0	37·5	......	44·0	41·0	3·0	37·5	......	......	44·0
(21)	2 23 45 „	27·223	44·0	......	(2,670)	......	......	......	......	......	......	......	......	......	......	37·5	
	2 24 0 „	27·262	44·0	......	2,689	44·2	41·0	3·2	37·3	......	......	......	......	......	......	......	44·0
	2 25 0 „	26·262	44·5	27·30	2,689	44·5	41·0	3·5	37·0	44·5	......	......	......	......	......	......	45·0
	2 26 0 „	26·943	44·0	......	3,005	44·5	40·8	3·7	36·4	......	......	......	......	......	......	......	44·7
(22)	2 27 0 „	26·663	44·0	......	3,282	43·5	39·5	4·0	34·7	......	......	......	......	......	......	......	43·0
	2 28 0 „	26·266	......	......	3,675	42·2	38·1	4·1	33·1								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Too dark to read well. (2) Not sure of decimals in thermometer readings.
(3) Can scarcely take this reading; could not read after this; came down at $6^h 30^m$ at Pirton Grange, on the boundary of the counties of Hertford and Bedford; from 6^h I was watching the increasing darkness of the earth; the earth began to get dark at half-past 5 o'clock; it continuously increased.
(4) Cloudy; overcast; misty; thick. (5) Great deposit on Regnault's Hygrometer.
(6) Balloon left the earth. (7) Over the river.
(8) Changing direction towards S.W. (9) Moving directly down the river.
(10) The wind below is S.E. (11) We are now going N.E.
(12) Sensibly warm. (13) Mist. Crossing Tilbury line; off the river.
(14) Higher; moving more easterly; crossing Tilbury railway again.
(15) Quite warm.
(16) Mr. Norris from this time noted the first appearance of dew on the hygrometer.
(17) Still S.W. wind; going N.E. (18) Cloudy.
(19) Crossing Hainault Forest; in fog; all ponds covered with ice; the earth looks dull.
(20) Calm and warm to sense.
(21) Going due N.E; cannot go high with this wind.
(22) Gas let out; the earth looks dull and bare.

Table I.—Meteorological Observations made in the Seventeenth Balloon Ascent, from the Royal Arsenal, Woolwich, January 12, 1864.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened Bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	2 28 30 p.m.	26·119	......	......	3,821	41·5	36·2	5·3	29·5	41·5	......	......	......	......	......	......	41·5
(1)	2 30 0 ,,	25·890	......	......	4,044	38·0	33·5	4·5	27·4	......	......	......	......	......	......	27·5	
	2 31 0 ,,	24·972	......	......	5,001	36·2	33·1	3·1	28·5								
	2 31 15 ,,	......	......	......	(5,200)	36·0	32·2	3·8	26·5	......	......	......	......	......	......	26·1	
(2)	2 32 30 ,,	24·575	......	24·60	5,401	34·2	31·5	2·7	27·3								
	2 33 0 ,,	24·397	39·0	24·40	5,610	33·2	31·5	1·7	28·8	......	......	......	......	......	......	29·5	
	2 34 0 ,,	24·088	......	......	5,924	32·2	31·1	1·1	29·3	32·0	......	......	......	......	......	......	32·0
	2 34 30 ,,	23·880	......	23·90	6,144	31·5	30·5	1·0	30·1	31·0	......	......	......	......	......	......	32·7
	2 35 0 ,,	23·681	37·5	23·70	6,364	31·0	......	......	......	......	......	......	......	......	......	26·2	
	2 36 0 ,,	23·601	......	23·62	6,453	30·6	29·2										
	2 37 0 ,,	23·531	......	......	6,516	30·2	......										
(3)	2 37 30 ,,	23·282	......	......	6,802	29·2	......	......	......	......	......	......	......	......	......	11·5	
	2 39 0 ,,	23·232	......	23·25	6,844	29·2	......	......	......	29·2	......	......	......	......	......	11·5	
	2 40 0 ,,	23·283	......	......	......	29·8	......	......	......	......	......	......	......	......	......	......	29·8
	2 41 0 ,,	23·493	......	23·40	6,678	30·0	30·0	......	......	30·0	......	......	......	......	......	......	30·0
(4)	2 41 30 ,,	23·433	36·0	......	6,650	29·5	27·1	......	......	29·3	......	......	......	......	......	9·5	29·3
(5)	2 43 0 ,,	23·385	......	......	6,692	29·2	27·1										
(6)	2 44 0 ,,	......	......	......	(6,790)	29·4	......	......	......	......	......	......	......	......	......	9·0	
	2 45 0 ,,	23·187	......	......	6,885												
(7)	2 46 0 ,,	......	......	......	(6,885)												
(8)	2 46 10 ,,	23·187	35·0	23·20	6,885												
	2 47 0 ,,	23·087	35·0	23·10	6,984	30·8	29·0	......	......	30·7	......	......	......	......	......	......	30·7
(9)	2 47 15 ,,	......	......	......	(7,006)	30·7	29·0										
(10)	2 47 30 ,,	23·037	......	......	7,029												
	2 48 0 ,,	22·967	35·0	......	7,118	30·7	27·8										
	2 49 0 ,,	22·937	......	......	7,089	31·1	29·0	......	......	31·0							
	2 50 0 ,,	22·738	......	......	7,277	31·0	28·5	......	......	31·0	......	......	......	......	......	......	31·0
	2 51 0 ,,	22·608	34·5	......	7,448	30·5	26·5	......	......	......	......	......	......	......	......	4·5	
	2 52 0 ,,	22·488	34·2	......	7,602	29·2	25·0	4·2	9·8	......	......	......	......	......	......	6·0	
	2 52 30 ,,	22·438	34·0	......	7,666	29·2	24·5	4·7	7·5								
(11)	2 53 0 ,,	22·398	34·0	......	7,730	28·5	24·0	4·5	6·7								
	2 54 0 ,,	22·388	......	23·40	7,741	......	......	......	......	......	......	......	......	......	......	......	29·0
(12)	2 55 0 ,,	22·438	......	......	7,666	29·2	27·0	2·2	19·3								
(13)	2 56 0 ,,	22·489	......	22·50	7,614	29·2	27·1	2·1	20·6	......	......	......	......	......	......	......	29·2
(14)	2 57 0 ,,	22·889	......	......	7,044	30·5	27·2	3·3	17·6	......	......	......	......	......	......	......	30·5
	2 58 0 ,,	22·089	......	......	8,148	30·5	27·5	3·0	18·8	......	......	......	......	......	......	......	30·5
	2 59 0 ,,	23·039	34·0	23·05	6,768	30·5	27·1	3·4	17·2								
(15)	3 0 0 ,,	22·439	......	......	7,666	29·1	25·1	4·0	10·6	......	......	......	......	......	......	11·2	
	3 1 0 ,,	22·439	......	......	7,666	28·5	24·5	4·0	9·0								
(16)	3 2 0 ,,	22·293	32·0	......	7,931	27·2	23·1	4·1	4·2	......	27·2	22·2	5·0	−0·8	......	......	28·0
(17)	3 3 0 ,,	22·143	32·0	......	8,086	27·2	23·1	4·1	4·2	......	......	......	......	......	......	......	27·5
(18)	3 4 0 ,,	22·043	......	......	8,189	27·2	23·5	3·7	6·5	......	......	......	......	......	15 no dew	......	27·2
	3 5 0 ,,	21·993	......	......	8,230	27·0	23·5	3·5	7·4								
	3 5 30 ,,	......	......	......	(8,288)	......	......	......	......	......	......	......	......	......	......	5·0	
(19)	3 6 0 ,,	21·944	31·5	......	8,346	26·5	23·7	2·8	10·2	......	......	......	......	......	......	......	26·5
(20)	3 8 0 ,,	21·595	31·0	21·60	8,766	26·0	22·5	3·5	4·7	26·0	......	......	......	......	......	......	26·0
	3 9 0 ,,	21·485	31·0	......	8,894	25·5	22·6	2·9	7·2	......	25·5	22·8	2·7	8·5			
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Sudden change of temperature and direction.
(2) Going N.; wind S.
(3) The wind below is S.E.
(4) Cloudy; gas opake.
(5) Can see Chelmsford.
(6) Can hear machinery in action.
(7) Can hear steam-ploughing and a thrashing-machine.
(8) Can see up balloon now; gas not quite transparent.
(9) Can just see the Thames south of us; going N. still.
(10) Can hear people's voices.
(11) We are very warm.
(12) Can see Blackwater; estimated distance from coast twenty miles.
(13) Going N. still; determined to go higher.
(14) Ozone = 1.
(15) Colder current.
(16) In another current.
(17) Going N.N.E.; wind S.S.W.
(18) Could not get Daniell lower than 15°.
(19) Ozone = 1.
(20) Iodine paper slightly coloured in 5 minutes.

Table I.—Meteorological Observations made in the Seventeenth Balloon Ascent, from the Royal Arsenal, Woolwich, January 12, 1864.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened Bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	3 10 0 p. m.	21·296	30·5	......	9,104	24·5	21·2	3·3	+ 2·4	24·5	......	......	......	......	......	......	24·5
(2)	3 11 0 „	21·295	31·0	......	9,105	23·0	19·5	3·5	− 0·5	......	23·0	19·8	3·2	−0·2			
	3 12 0 „	21·197	......	......	9,217	22·8											
	3 13 0 „	21·097	......	......	9,327	21·5	ice.										
(3)	3 14 0 „	21·001	......	......	9,437	20·5	25·0										
(4)	3 15 0 „	21·001	28·0	......	9,437	20·5	25·0	......	......	......	......	......	......	......	......	......	20·5
	3 15 30 „	20·951	28·0	......	9,500	20·5	19·0	1·5	+ 8·6	......	20·0	19·2	0·8	13·5	......	......	20·5
(5)	3 16 0 „	20·951	28·0	20·95	9,500	20·5	17·5	3·0	− 3·5	......	20·5	17·0	3·5	−7·5	−2·0	−2·0	20·5
	3 16 30 „	20·951	28·0	20·95	9,500	20·5	18·4	2·1	+ 3·8	......	20·5	18·5	2·0	4·5	......	......	20·5
(6)	3 17 0 „	20·921	......	......	9,536	21·0	18·5	2·5	1·3								
	3 17 30 „	20·902	27·5	20·90	9,560	21·0	18·7	2·3	2·9	......	......	......	......	......	......	......	21·0
(7)	3 18 0 „	20·882	......	......	9,586	21·0	18·5	2·5	1·3	......	21·0	18·5	2·5	1·5	......	......	21·0
(8)	3 19 0 „	20·702	......	......	9,822	20·0	18·5	1·5	7·8	......	20·0	18·5	2·5	1·5	......	......	20·0
(9)	3 20 0 „	20·402	......	......	10,017	17·5	16·2	1·3	+ 6·4								
(10)	3 21 0 „	20·352	......	......	10,090	17·2	15·0	2·2	− 1·7	......	......	......	......	......	......	......	17·2
	3 21 20 „	20·355	26·0	20·35	10,090	17·2	15·0	2·2	− 1·7	......	......	......	......	......	−2·0	......	17·1
(11)	3 21 40 „	20·205	......	......	10,319	16·2	14·1	2·1	− 2·1	......	......	......	......	......	......	......	16·2
	3 22 0 „	20·155	......	......	10,394	15·9	13·8	2·1	− 2·4								
	3 22 30 „	20·105	......	20·10	10,469	15·5	13·1	2·4	− 5·4	15·2	......	......	......	......	......	......	15·2
	3 23 0 „	20·105	25·0	20·10	10,469	15·0	13·0	2·0	− 2·5	15·0	......	......	......	......	......	......	15·0
	3 24 0 „	20·005	......	......	10,619	14·0	11·0	3·0	−12·2	......	......	......	......	......	......	......	14·0
(12)	3 25 0 „	19·606	......	......	11,016	13·2	11·1	2·1	− 5·2								
(13)	3 26 0 „	19·406	......	19·40	11,278	12·1	9·4	2·7	−11·5								
	3 27 0 „	19·386	......	......	11,429	11·5	9·2	2·3	− 8·6								
	3 27 30 „	19·307	......	19·30	11,533	11·1	9·2	1·9	− 5·5								
(14)	3 28 0 „	19·209	......	......	11,664	11·2	9·1	2·1	− 7·2	......	11·2	9·1	2·1	......	0·0		
	3 29 0 „	19·209	......	......	11,664	11·1	9·0	2·1	− 7·3								
(15)	3 29 30 „	19·160	......	......	11,708	11·0	8·7	2·3	− 7·4								
(16)	3 29 45 „	19·110	......	......	11,761	11·0	8·7	2·3	− 7·4								
	3 30 30 „	19·060	......	......	......	11·2	8·5	2·7	−12·5								
	3 31 30 „	19·012	......	......	11,897	11·0	8·3	2·7	−12·7								
(17)	3 32 0 „	19·112	......	......	11,774	13·2	12·5	0·7	+ 7·1								
(18)	3 33 0 „	19·313	......	......	11,528												
	3 34 0 „	19·313	......	......	11,528	14·5	13·8	0·7	8·3								
(19)	3 35 0 „	19·433	......	......	11,353												
	3 35 30 „	19·663	......	......	11,071	15·0	13·8	1·2	+ 4·5								
(20)	3 36 0 „	19·714	......	......	11,007												
(21)	3 36 30 „	19·814	......	......	10,879												
	3 37 0 „	19·914	......	......	10,751	16·0	14·0	2·0	− 1·4								
	3 37 30 „	19·964	......	......	10,697	16·0	15·2	0·8	+ 9·0								
	3 38 0 „	20·064	......	......	10,561	16·2	15·8	0·4	14·3								
	3 38 15 „	20·365	......	20·25	10,289	16·2	16·0	0·2	14·5	......	......	......	......	......	......	......	16·5
	3 38 30 „	20·316	20·0	20·30	10,221	16·2	16·0	0·2	14·5	......	......	......	......	......	......	......	16·2
	3 39 0 „	20·416	......	20·40	10,085	16·2	16·0	0·2	14·5	......	......	......	......	......	......	......	16·2
	3 39 10 „	20·466	20·0	20·45	10,017	16·2	16·0	0·2	14·5	......	......	......	......	......	......	......	16·2
(22)	3 39 20 „	20·536	20·0	20·50	9,921	16·5	16·3	0·2	14·8	......	......	......	......	......	......	......	16·5
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Ozone = 1. (2) Applied water to wet-bulb thermometer.
(3) On a level with Harwich or Colchester. (4) Regnault failed; misty.
(5) Ozone = 1; Iodine = 1. (6) Ozone = 1; Iodine paper = 1.
(7) Regnault's Hygrometer will not act. (8) Cloudy.
(9) Cold to sense; changed direction; wind S.S.E.
(10) Regnault difficult to work and to get dew deposited. (11) Over Newmarket.

(12) Hoar-frost on ropes and all round the neck of the balloon in long fringes.
(13) Earth nearly obscured. (14) Filled one air-bag; Regnault failed again.
(15) Fine snow under us.
(16) Filled the second bag with air; can rise no higher. (17) Snow granular.
(18) Repeated application of ether to Daniell's Hygrometer was not followed by the usual deposition of dew on the blackened bulb. (19) Rabbits heavy and dull.
(20) Snow fine and thin. (21) Dog whining. (22) Snow still granular.

TABLE I.—Meteorological Observations made in the Seventeenth Balloon Ascent, from the Royal Arsenal, Woolwich, January 12, 1864.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	3 39 30 p.m.	20·836	20·0	......	9,516	16·8	16·5	0·3	14·3	......	......	......	......	......	......	......	16·8
	3 39 45 „	20·916	20·0	......	9,408	17·2	17·0	0·2	15·5	......	......	......	......	......	......	......	17·2
	3 40 0 „	21·016	......	......	9,273	18·0	18·0	0·0	18·0	......	......	......	......	......	......	......	18·2
	3 40 30 „	21·065	......	21·05	9,316	18·0	18·0	0·0	18·0	......	......	......	......	......	......	......	18·2
(2)	3 41 0 „	21·215	......	21·20	9,199	18·5	18·3	0·2	16·9	......	......	......	......	......	......	......	18·5
	3 41 15 „	21·265	......	21·25	9,156												
(3)	3 41 30 „	21·415	......	21·40	9,026	20·0	19·8	0·2	18·4								
	3 41 45 „	21·515	......	21·55	8,939	21·0	20·5	0·5	17·1	......	......	......	......	......	......	......	21·0
	3 42 30 „	21·714	......	21·70	8,765	21·0	20·5	0·5	17·1	......	......	......	......	......	......	......	21·0
	3 44 0 „	21·444	......	......	8,904	21·8	21·5	0·3	19·6								
	3 44 30 „	22·213	22·0	......	7,993	22·5	22·0	0·5	18·9	......	......	......	......	......	......	......	22·5
(4)	3 45 0 „	22·433	22·0	......	7,732	22·5	22·0	0·5	18·9								
(5)	3 47 0 „	22·723	......	......	7,447	23·2	22·9	0·3	21·1	......	......	......	......	......	......	......	23·2
(6)	3 47 30 „	22·863	......	......	7,226	24·0	24·0	0·0	24·0								
	3 47 45 „	22·963	......	......	7,136	24·2	24·0	0·2	22·9								
(7)	3 48 0 „	23·113	22·0	......	6,967	24·5	24·4	0·1	23·9								
(8)	3 49 0 „	23·414	......	......	6,640	25·2	25·1	0·1	24·6								
(9)	3 49 30 „	23·713	......	......	6,313	26·0	25·8	0·2	24·8								
	3 50 0 „	23·813	......	......	6,204	26·2	26·0	0·2	25·1								
(10)	3 50 30 „	23·962	......	......	6,040	26·5	26·0	0·5	23·7								
	3 51 0 „	24·062	......	......	5,932	26·9	26·8	0·1	26·4								
	3 51 30 „	24·161	......	......	5,824	27·0	26·8	0·2	25·9								
	3 52 0 „	24·311	......	......	5,670	27·6	27·3	0·3	26·0								
	3 52 30 „	24·360	24·0	......	5,619	28·1	27·9	0·2	27·1								
	3 53 0 „	24·509	......	......	5,465	28·5	28·3	0·2	27·6	......	......	......	......	......	......	......	28·5
	3 53 30 „	24·588	......	......	5,384	29·1	28·8	0·3	27·8								
(11)	3 54 0 „	24·687	......	......	5,284	29·2	29·0	0·2	28·4								
	3 54 30 „	24·827	......	......	5,142	30·3	30·3	0·0	30·3	......	......	......	......	......	......	......	30·5
	3 55 0 „	25·306	......	......	4,636	31·0	30·7	0·3	29·9								
	3 55 30 „	25·206	......	......	4,739	31·2	31·1	0·1	30·8								
	3 56 0 „	25·804	27·0	......	4,121												
	3 56 15 „	......	......	......	(4,183)	31·5	31·2	0·3	30·5								
	3 56 30 „	25·703	27·0	......	4,224	32·2	30·8	1·4	27·7								
	3 57 0 „	25·951	28·0	......	3,973	32·5	32·0	0·5	31·0								
	3 58 0 „	......	......	......	(3,703)	34·2	32·0	2·2	28·2								
	3 59 0 „	26·500	......	......	3,433	36·0											
(12)	4 0 0 „	26·550	......	......	3,384	36·2											
(13)	4 0 30 „	26·779	......	......	3,159												
(14)	4 1 0 „	26·849	......	......	3,091	37·2	......	......	......	......	......	......	......	......	......	......	37·5
	4 1 15 „	26·984	......	......	2,953	37·5											
	4 1 30 „	27·122	29·5	......	2,821	38·0											
	4 2 0 „	27·445	......	......	2,451	38·5	38·5	0·0	38·5								
	4 2 30 „	27·511	32·0	......	2,384	39·2	38·5	0·7	37·6								
	4 3 0 „	27·811	32·2	......	2,096	39·8	39·2	0·6	38·5								
	4 3 30 „	28·089	33·0	......	1,878	40·8	40·0	0·8	39·0								
(15)	4 4 0 „	28·188	33·5	......	1,807	41·0	40·5	0·5	39·9								
	4 5 0 „	28·586	......	......	1,415	40·0	39·0	1·0	36·5								
	4 7 0 „	28·633	......	......	1,366	40·0	39·5	0·5	37·6								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) I am redder than usual, and my eyes are suffused. Mr. Norris is reddish blue.
(2) Note-book covered with snow. The ether is not good.
(3) Clouds below us; very dense cloud above us.
(4) Above cloud; the view is beautiful. Line of cloud due N. and S.
(5) Line of cloud remarkably well defined.
(6) About entering cloud. (7) In cloud.
(8) Out of cloud. (9) Cannot tell where we are. (10) Very misty.
(11) Ozone =1. (12) Applied water to the Wet-bulb; forest of pines.
(13) Can see a circle of trees. (14) Villages scarce.
(15) Cannot see two miles ahead.

Table I.—Meteorological Observations made in the Seventeenth Balloon Ascent, from the Royal Arsenal, Woolwich, January 12, 1864.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened Bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	4 8 0 p.m.	28·581	......	......	1,420	39·8	38·0	1·8	35·7								
(1)	4 8 30 „	28·680	......	......	1,324	40·0	39·5	0·5	37·6								
	4 9 0 „	28·498	......	......	1,514	40·4	39·8	0·6	39·0								
(2)	4 9 20 „																
	4 9 30 „	29·977	......	......	ground.	41·8	40·7	1·1	38·8								
	Meteorological Observations made in the Eighteenth Balloon Ascent, from the Royal Arsenal, Woolwich, April 6, 1864.																
(3)	....	30·204	......	30·24	......	46·2	43·1	3·1	39·6	......	......	......	......	......	42·5		
	3 20 0 p.m.	30·204	......	30·24	......	47·0	44·2	2·8	41·0								
	4 7 0 „	30·114	......	30·19	......	46·0	42·5	3·5	38·5								
	4 8 0 „	30·114	......	30·19	......	46·0	42·5	3·5	38·5	......	......	......	......	......	40·0		
	4 9 0 „	30·094	......	30·17	......	45·7											
	4 9 10 „	......	......	......	......	45·5											
	4 9 30 „	29·875	......	......	320	45·5	42·0	3·5	37·9								
	4 9 40 „	29·604	45·5	29·65	557	44·8	41·5	3·3	37·7								
(4)	4 10 10 „	29·274	......	......	867	42·0	38·7	3·3	34·6	41·8	......	......	......	......	......	......	43·0
	4 11 30 „	28·876	......	......	1,219												
	4 12 0 „	28·658	45·0	......	1,400	40·8	37·2	3·6	32·6								
	4 13 0 „	28·258	45·0	28·25	1,749												
(5)	4 14 0 „	27·879	......	28·00	2,161	37·8	36·1	1·7	33·8								
(6)	4 14 30 „	27·762	......	27·73	2,170	36·5	35·5	1·0	34·0	......	......	......	......	......	......	35·0	
(7)	4 15 0 „	27·564	......	......	2,469	36·0	35·2	0·8	33·9								
(8)	4 16 0 „	27·245	42·5	27·25	2,775	......	......	......	......	34·5	......	......	......	......	......	......	35·9
(9)	4 16 30 „	26·817	42·0	......	3,194	34·5	33·2	1·3	31·0								
(10)	4 16 45 „																
	4 17 0 „	26·649	......	26·68	3,362												
(11)	4 18 0 „	26·490	......	26·51	3,507	33·1	32·5	0·6	31·5	......	......	......	......	......	32·0		
(12)	4 19 0 „	26·152	40·5	26·15	3,884	......	......	......	......	32·0	......	......	......	......	......	......	34·1
(13)	4 19 30 „																
(14)	4 20 0 „	25·873	......	......	4,260	33·0	32·1	0·9	30·3								
(15)	4 20 30 „	25·724	39·5	25·70	4,404	34·2	32·2	2·0	28·7	33·3	......	......	......	......	......	......	35·5
	4 22 0 „	25·175	......	......	4,873	36·0	34·1	1·9	31·2								
(16)	4 23 0 „	24·825	......	24·85	5,251	36·2	35·2	1·0	33·4	34·2	......	......	......	......	......	......	38·1
	4 25 0 „	24·296	......	24·31	5,827	36·0	34·5	1·5	32·2	34·8	......	......	......	......	......	33·2	36·2
(17)	4 25 30 „	......	......	......	(6,163)	......	......	......	......	......	......	......	......	......	32·7		
	4 26 0 „	23·696	......	......	6,500	34·2	33·1	1·1	28·5	35·5	......	......	......	......	......	......	34·8
(18)	4 26 30 „	......	......	......	(6,627)												
(19)	4 27 30 „	23·378	39·0	23·40	6,882	38·5	37·2	1·3	35·4	......	......	......	......	......	......	33·0	
(20)	4 28 0 „	23·001	......	......	7,281												
	4 29 0 „	22·834	......	22·85	7,493	40·2	36·0	4·2	30·6	36·0	......	......	......	......	......	......	42·1
(21)	4 30 0 „	22·329	......	22·35	8,083	39·0	33·1	5·9	25·3	......	......	......	......	......	......	25·0	
	4 32 0 „	21·898	......	21·92	8,594	35·6	30·5	5·1	22·6	......	36·1						
	4 34 0 „	21·678	......	......	8,854	34·2	30·0	4·2	22·6	36·0	......	......	......	......	......	......	35·1
(22)	4 34 30 „	21·487	......	21·51	9,090	34·5	29·1	5·4	20·0	......	......	......	......	......	......	18·2	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Can scarcely see to read; very misty.
(2) On the ground at Lakenheath Warren, near Brandon. Never saw the sun, and there was therefore no opportunity for using the actinometer, polariscope, or spectroscope.
(3) The sky uniformly cloudy; no sun; objects misty in the distance; wind S.E.
(4) Very misty. (5) Entered a W.S.W. current. (6) Misty; entering cloud.
(7) Moving down the river. (8) Over the edge of the river on the Essex side.
(9) In cloud. (10) Getting lighter. (11) The goat uneasy; fog wetting.
(12) Much lighter. (13) In mist; can see the sun's outline.
(14) Two layers of cloud. (15) Goat less uneasy.
(16) Can see a very large oval in the cloud, with balloon in the centre; no prismatic colours; no break in the clouds. (17) Gas clearer. (18) Immense halo upon the cloud.
(19) Shadow of balloon on clouds; very fine; blue sky.
(20) Beautiful sound heard when closing the valve.
(21) Can feel wind pressing against us. (22) Sun warm.

Table I.—Meteorological Observations made in the Eighteenth Balloon Ascent, from the Royal Arsenal, Woolwich, April 6, 1864.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	4 35 0 p.m.	21·276	......	......	9,378	34·5	27·2	7·3	15·0								
	4 36 0 „	20·676	......	20·72	10,155	35·2	27·5	7·7	15·2								
	4 36 30 „	20·177	......	20·20	10,805	36·0	27·8	8·2	15·5	34·0	......	......	......	......	......	......	41·0
(1)	4 37 0 „	19·976	......	20·00	11,075	36·5											
(2)	4 37 30 „																
	4 38 0 „	20·026	......	......	10,987	39·0	29·2	9·8	16·3								
	4 38 + „	......	......	......	(10,730)	......	......	......	......	......	......	......	......	......	......	16·0	
	4 39 0 „	20·474	......	20·50	10,470	43·0	33·8	9·2	22·7	......	......	......	......	......	......	......	48·5
	4 39 + „	......	......	......	(10,300)	......	......	......	......	......	......	......	......	......	23·0		
	4 39 10 „	20·673	43·0	......	10,240												
	4 40 0 „	20·873	......	20·90	10,010	46·0	35·1	10·9	22·7	48·5						[no dew	
	4 40 30 „	20·972	......	21·00	9,895	46·1	35·0	11·1	22·4	......	......	......	......	......	......	35·0	
(3)	4 41 0 „	21·271	44·0	......	9,513	46·2	35·1	11·1	22·5								
	4 42 0 „	21·967	45·0	......	8,642	46·8	37·1	9·7	26·2	......	......	......	......	......	......	......	51·0
	4 43 0 „	22·676	......	......	7,783	......	......	......	......	......	......	......	......	......	......	......	52·0
	4 44 0 „	22·744	46·0	......	7,696	47·2	37·8	9·4	26·2	22·7							
	4 44 + „	......	......	......	(7,610)	......	......	......	......	......	......	......	......	......	26·0		
	4 44 30 „	22·764	......	22·80	7,524	46·2	37·1	9·1	26·7	......	......	......	......	......	......	......	53·0
	4 46 0 „	22·564	......	......	7,869	46·0	36·5	9·5	25·6	......	......	......	......	......	......	......	53·0
	4 46 30 „	22·514	......	......	7,947	46·0	37·5	8·5	27·8	......	......	......	......	......	......	......	53·0
(4)	4 47 0 „	22·564	......	......	7,553	46·0	37·5	8·5	27·8								
	4 47 30 „	22·981	48·0	......	7.410	46·2	38·5	7·7	29·6	......	......	......	......	......	......	......	54·0
	4 48 0 „	23·309	48·0	23·38	7,036	46·2	38·4	7·8	29·5	......	......	......	......	......	......	24·5	53·7
	4 50 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	25·0		
(5)	4 50 30 „	24·060	......	......	6,153	44·0	37·8	6·2	30·4	......	......	......	......	......	......	......	47·0
(6)	4 51 0 „	24·537	......	......	5,536	43·8	38·3	5·5	31·6								
	4 52 0 „	24·906	......	25·00	5,213	43·0	38·0	5·0	32·0								
	4 52 30 „	25·955	......	......	4,163	42·2	38·0	4·2	32·9								
	4 53 0 „	......	......	......	(4,049)	......	......	......	......	......	......	......	......	......	34·0		
	4 53 30 „	......	......	......	(3,935)	......	......	......	......	......	......	......	......	......	......	35·0	
	4 54 0 „	26·254	......	......	3,821	41·0	38·0	3·0	34·2	41·0	......	......	......	......	......	......	41·0
(7)	4 54 30 „	26·654	......	......	3,405	41·0	37·1	3·9	32·2								
	4 54 45 „	26·773	......	......	3,280	40·4	36·8	3·6	32·2								
(8)	4 55 0 „	26·953	......	......	3,071	39·9	36·5	3·4	32·0								
	4 56 0 „	27·153	......	......	2,881	39·1	36·0	3·1	31·9								
	4 56 30 „	27·352	......	......	2,691	39·5	36·2	3·3	31·8	......	......	......	......	......	34·0		
	4 58 0 „	28·250	......	......	1,836	39·8	37·1	2·7	33·6								
	4 59 0 „	28·670	......	......	1,437	40·0	37·8	2·2	34·9								
	4 59 30 „	28·949	......	......	1,163	40·6	38·1	2·5	34·9								
	5 0 0 „	29·049	......	29·10	1,069	41·5	38·6	2·9	34·9								
	5 1 0 „	29·099	......	......	1,024	41·8	38·7	3·1	34·8								
	5 2 0 „	29·149	......	......	979	41·9	38·8	3·1	35·0								
	5 3 0 „	29·268	......	......	869	42·0	38·7	3·3	34·6								
	5 4 0 „	29·468	......	......	725	42·9	39·4	3·5	35·2								
	5 5 0 „	29·628	......	......	545	43·5	39·9	3·6	35·5								
	5 6 0 „	29.678	......	......	497	45·0	41·2	3·8	36·8								
	5 7 0 „	29·748	......	......	416	45·8											
(9)	5 25 0 „	29·828	48·1	29·85	ground.	47·0	42·2	4·8	36·8	47·0	......	......	......	......	37·0	37·5	43·6
	1	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) A rent in the balloon; very high up.
(2) Very warm.
(3) Heard railway trains.
(4) Valve opened.
(5) Entered cloud and lost sight of sun.
(6) Stratus clouds on our level.
(7) We are over water.
(8) Raining.
(9) On the ground in Wilderness Park.

TABLE I.—Meteorological Observations made in the Nineteenth Balloon Ascent, from the Crystal Palace, Sydenham, June 13, 1864.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	6 58 0 p.m.	......	......	29·30	......	61·5	52·5	9·0	44·7	......	......	......	......	......	......	44·0	
	7 0 0 „	......	......	29·30	......	61·8	51·7	10·1	43·1								
	7 0 10 „	......	......	29·25	317	60·0	51·0	9·0	43·1								
	7 0 20 „	......	......	29·13	491	59·1	50·1	9·0	42·1								
	7 0 30 „	......	......	28·92	691	59·2	50·1	9·1	41·9								
	7 1 0 „	......	......	28·75	885	59·1	50·0	9·1	41·9								
(2)	7 1 30 „	......	......	28·47	1,155	58·2	50·2	8·0	43·0								
	7 2 0 „	......	......	28·36	1,265	57·2	48·2	9·0	40·0								
	7 2 10 „	......	......	28·15	1,437	56·8	48·1	8·7	44·1								
	7 2 30 „	......	......	27·95	1,635	56·0	48·1	7·9	40·7								
	7 2 45 „	......	......	27·90	1,685	55·5	48·1	7·4	43·0								
	7 3 15 „	......	......	27·61	1.982	54·1	46·5	7·6	39·0	......	......	......	......	......	......	40·5	
	7 4 0 „	......	......	27·45	2,132	54·2	47·1	7·1	40·1								
(3)	7 5 0 „	......	......	27·30	2,282	54·0	47·1	6·9	40·3								
	7 5 20 „	......	......	27·18	2,301	52·5	47·1	5·4	41·6								
	7 5 55 „	......	......	27·05	2,530	52·2	46·1	6·1	39·9								
	7 6 0 „	......	......	26·95	2,630	52·1	46·1	6·0	40·0								
	7 6 30 „	......	......	26·80	2,780	52·1	46·2	5·9	40·2								
	7 7 0 „	......	......	26·74	2,840	52·5	45·7	6·8	38·8								
	7 7 15 „	......	......	26·70	2,880	(52·2)	......	......	......	......	......	......	......	......	......	......	53·0
	7 7 30 „	......	......	26·70	2,880	52·0	45·5	6·5	38·9								
	7 8 0 „	......	......	26·56	3,031	51·5	45·0	6·5	39·8	......	......	......	......	......	......	38·5	
	7 9 0 „	......	......	26·65	2,937	51·0	45·1	5·9	39·0								
	7 10 0 „	......	......	26·75	(2,630)	(51·7)	......	......	......	......	......	......	......	......	......	......	53·0
	7 10 30 „	......	......	27·05	2,530	52·5	45·6	6·9	38·5								
	7 11 0 „	......	......	27·05	2,520	52·5	46·0	6·5	39·5								
(4)	7 11 30 „	......	......	27·20	2,380	52·8	45·9	6·9	39·0	......	......	......	......	......	......	......	55·5
	7 12 0 „	......	......	......	(2,330)	(53·3)	......	......	......	......	......	......	......	......	......	......	56·0
	7 12 30 „	......	......	27·20	2,280	53·8	46·6	7·2	39·6								
	7 13 0 „	......	......	27·15	2,327	52·8	46·0	6·8	39·2								
	7 13 30 „	......	......	27·13	2,337	51·5	45·2	6·3	38·8								
	7 14 0 „	......	......	27·05	2,522	51·0	45·0	6·0	38·8								
	7 14 30 „	......	......	26·95	2,604	50·5	44·8	5·7	38·9								
(5)	7 15 0 „	......	......	26·87	2,694	50·2	44·2	6·0	37·8								
	7 16 0 „	......	......	26·70	2,854	49·0	43·5	5·5	37·5								
	7 16 30 „	......	......	26·56	3,004	48·2	43·5	4·7	38·3								
	7 17 0 „	......	......	......	(3,055)	......	......	......	......	......	......	......	......	......	......	35·0	
	7 17 30 „	......	......	26·47	3,106	47·2	42·6	4·6	37·4	......	......	......	......	......	......	......	47·5
(6)	7 18 0 „	......	......	......	(3,234)												
	7 18 10 „	......	......	26·30	3,276	46·8	42·5	4·3	37·7								
	7 18 40 „	......	......	26·32	3,296	46·9	42·0	4·9	36·5								
	7 19 0 „	......	......	......	(3,337)	(46·7)	......	......	......	......	......	......	......	......	......	......	46·3
	7 20 0 „	......	......	26·13	3,461	46·6	42·1	4·5	37·0	......	......	......	......	......	......	37·5	
(7)	7 21 0 „	......	......	26·35	3,291	46·5	42·1	4·4	38·4								
	7 22 0 „	......	......	26·33	3,307												
	7 22 30 „	......	......	26·33	3,307	47·2	44·1	3·1	40·9								
	7 23 0 „	......	......	26·35	3,327	47·2	44·1	3·1	40·9								
(8)	7 23 30 „	......	......	26·35	3,327	47·2	44·0	3·2	41·0	......	......	......	......	......	......	40·0±	
	7 25 0 „	......	......	26·24	3,407	48·0	44·1	3·9	39·8								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Cloudless; horizon misty; moon bright; left the earth.
(2) London misty; apparently going over the Isle of Dogs.
(3) Sun on water dazzling in the direction of London.
(4) Sun bright.
(5) In a line with Charlton.
(6) In a line with Woolwich.
(7) Heard a gun fired on Woolwich Common. Report heard 10 seconds after seeing the flash.
(8) Lowering grapnel. Gas transparent.

Table I.—Meteorological Observations in the Nineteeth Balloon Ascent, from the Crystal Palace, Sydenham, June 13, 1864.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	7 26 0 p.m.	......	......	26·17	3,459	48·2	44·2	4·0	36·8								
	7 27 0 ,,	......	......	26·15	3,463	48·5	44·1	4·4	39·3								
	7 27 30 ,,	......	......	26·06	3,536	47·0	41·2	5·8	34·7								
(1)	7 28 30 ,,	......	......	26·05	3,543	47·1	41·1	6·0	34·4								
	7 29 0 ,,	......	......	26·05	3,543	47·0	41·0	6·0	34·3								
(2)	7 30 0 ,,	......	......	26·05	3,543	46·0	40·5	5·5	34·2								
(3)	7 31 0 ,,	......	......	26·13	3,517	46·0	40·5	5·5	34·2								
	7 32 0 ,,	......	......	......	(3,445)	......	......	......	......	......	......	......	......	......	......	35·0	
	7 32 30 ,,	......	......	26·27	3,409	47·0	41·8	5·2	35·9								
	7 32 45 ,,	......	......	26·35	3,349	48·2	43·0	5·2	37·3	......	......	......	......	......	......	......	48·5
	7 33 0 ,,	......	......	26·70	3,097	49·0	44·2	4·8	39·0								
	7 34 0 ,,	......	......	26·87	2,755	51·2	45·0	6·2	38·6								
	7 35 0 ,,	......	......	26·90	2,680	51·1	44·5	6·6	37·7								
	7 36 0 ,,	......	......	27·05	2,527	51·0	44·8	6·2	38·3								
	7 36 30 ,,	......	......	27·05	2,527	51·1	45·5	5·6	39·7								
(4)	7 37 30 ,,	......	......	26·94	2,740	50·5	45·0	5·5	39·4								
	7 38 0 ,,	......	......	26·90	2,782	50·2	45·0	5·2	39·5								
	7 38 10 ,,	......	......	......	(2,790)	......	......	......	......	......	......	......	......	......	......	39·5	
(5)	7 39 0 ,,	......	......	26·85	2,834	49·5	44·2	5·3	38·5								
	7 39 30 ,,	......	......	26·83	2,854	50·2	45·0	5·2	39·5								
	7 40 0 ,,	......	......	26·85	2,834	51·0	45·1	5·9	39·0								
	7 42 0 ,,	......	......	26·87	2,812	51·8	45·7	6·1	39·5								
	7 43 0 ,,	......	......	26·94	2,740	51·8	45·8	6·0	39·7								
	7 44 0 ,,	......	......	......	(2,683)	52·0	46·0	6·0	39·9								
	7 45 0 ,,	......	......	27·05	2,625	51·9	46·0	5·9	40·0								
	7 46 0 ,,	......	......	......	(2,550)	(52·0)	......	......	......	......	......	......	......	......	......	39·5	
	....	......	......	27·20	2,470	52·0	46·1	5·9	40·1								
	7 46 30 ,,	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	52·0
	7 47 30 ,,	......	......	26·95	2,629	51·0	45·5	5·5	39·8								
	7 48 0 ,,	......	......	26·89	2,689	51·0	45·0	6·0	38·8								
	7 49 0 ,,	......	......	26·83	2,740	51·5	45·2	6·3	38·4								
	7 49 30 ,,	......	......	26·75	2,823	51·8	45·0	6·8	38·1								
	7 50 0 ,,	......	......	26·65	2,927	51·5	46·0	5·5	40·4								
	7 50 30 ,,	......	......	26·56	3,017	51·0	46·2	4·8	41·2								
	7 51 0 ,,	......	......	26·55	3,027	......	......	......	......	......	......	......	......	......	......	39·0	
	7 52 0 ,,	......	......	26·53	3,053	49·2	43·0	6·2	36·3								
	7 52 30 ,,	......	......	26·83	2,753	49·0	43·4	5·6	37·3								
	7 53 0 ,,	......	......	26·95	2,613	49·0	44·0	5·0	38·6								
	7 54 0 ,,	......	......	27·20	2,363	50·5	46·0	4·5	41·3								
	7 55 0 ,,	......	......	27·40	2,003	51·7	47·6	4·1	43·4								
	7 56 0 ,,	......	......	27·65	1,923	53·0	50·0	3·0	47·0								
	7 58 0 ,,	......	......	27·77	1,807	53·2	50·0	3·2	46·8								
	8 0 0 ,,	......	......	27·85	1,726	53·5	50·0	3·5	46·6								
(6)	8 2 0 ,,	......	......	28·35	1,238	53·5	50·0	3·5	46·6								
(7)	8 14 0 ,,	......	......	29·49	} ground.	53·3	49·1	4·2	44·9								
	8 15 0 ,,	......	......	29·50		54·0	50·0	4·0	46·1								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Mist in horizon all round.
(2) Going towards Erith.
(3) Erith Church nearly under us.
(4) Over the river bank at $7^h\ 36^m\ 51^s$.
(5) Over the river bank on Essex side at $7^h\ 38^m\ 36^s$, therefore the river was crossed in $1^m\ 35^s$.
(6) Packed up the instruments.
(7) On the ground at East Hendon, five miles from Brentwood.

TABLE I.—Meteorological Observations made in the Twentieth Balloon Ascent, from Derby, June 20, 1864.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therm. (aspirated.) Dry.	Dry and Wet Therm. (aspirated.) Wet.	Dry and Wet Therm. (aspirated.) Diff.	Dry and Wet Therm. (aspirated.) Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened Bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	4 10 0 p.m.	......	......	29·91	......	66·8	59·5	7·3	53·2	......	......	......	......	......	......	45·0	
(2)	5 15 0 „	......	......	......	......	65·8	58·9	6·9	53·5	......	......	......	......	......	......	......	66·0
	6 10 0 „	......	......	29·88	......	66·0	60·0	6·0	55·1								
	....	......	......	......	......	66·5	59·5	7·0	53·9								
(3)	6 17 0 „	......	......	29·86	......	65·0	60·0	5·0	55·9								
	6 17 30 „	......	......	29·56	511	65·0	58·0	7·0	52·3								
(4)	6 18 0 „	......	......	29·28	772	63·2	57·1	6·1	51·9								
	6 18 20 „	......	......	29·01	1,022												
(5)	6 18 30 „	......	......	28·95	1,082	62·1	56·1	6·0	50·9								
(6)	....	......	......	......	......	60·9	55·5	5·4	50·8								
(7)	6 19 0 „	......	......	28·56	1,462	60·5	55·0	5·5	50·2								
(8)	6 19 30 „	......	......	......	(1,582)	(59·0)	......	......	......	......	......	......	......	......	......	48·1	59·0
(9)	6 19 45 „																
(10)	6 20 0 „	......	......	28·23	1,702	58·2	54·1	4·1	50·4								
	6 20 30 „	......	......	28·01	2,006	58·2	54·1	4·1	50·4	......	......	......	......	......	......	......	58·2
	6 21 0 „	......	......	27·91	2,106	58·2	54·0	4·2	50·2								
	6 21 30 „	......	......	27·84	2,236	58·2	53·1	5·1	48·4	......	......	......	......	......	......	......	58·3
(11)	6 22 0 „	......	......	27·36	2,696	55·5	52·0	3·5	48·6								
(12)	6 22 20 „																
(13)	6 23 0 „	......	......	27·27	2,786	54·5	51·0	3·5	47·6	......	......	......	......	......	......	48·3	
(14)	6 24 0 „	......	......	26·96	3,086	54·0	51·0	3·0	48·1								
(15)	6 24 30 „	......	......	26·81	3,214	54·0	51·0	3·0	48·1								
(16)	6 25 0 „	......	......	......	(3,375)	53·0	50·6	2·4	48·0								
(17)	6 26 0 „	......	......	26·34	3,696	52·0	50·0	2·0	48·0								
	6 26 30 „																
	6 27 0 „	......	......	26·11	3,978	52·5	50·2	2·3	47·9	......	......	......	......	......	......	48·0	
	6 27 30 „	......	......	26·05	4,038	52·2	50·2	2·0	48·2								
	6 28 0 „	......	......	26·01	4,068	51·7	50·2	1·5	48·7								
	6 28 10 „	......	......	25·97	4,082	51·2	49·7	1·5	48·1								
	6 28 30 „	......	......	25·95	4,102	51·2	49·7	1·5	48·1								
(18)	6 29 0 „	......	......	25·95	4,102	51·2	49·2	2·0	47·1								
(19)	6 30 0 „	......	......	25·93	4,122	51·2	49·5	1·7	47·7								
	6 30 30 „	......	......	25·97	4,082	51·2	49·5	1·7	47·7								
(20)	6 31 0 „	......	......	26·04	4,006	51·2	49·2	2·0	47·1	......	......	......	......	......	......	48·0	
	6 32 0 „	......	......	26·19	3,841	51·2	49·2	2·0	47·1								
	6 33 0 „	......	......	26·77	3,242	52·0	50·0	2·0	48·0								
	6 34 0 „	......	......	26·81	3,202	52·2	50·5	1·7	48·8								
(21)	6 35 0 „	......	......	27·01	3,002	52·8	50·1	2·7	47·2								
(22)	6 35 15 „	......	......	27·16	2,840												
	6 36 0 „	......	......	27·26	2,740	53·5	51·2	2·3	48·9								
	6 36 30 „	......	......	27·26	2,740	53·5	51·5	2·0	49·5								
	6 36 40 „	......	......	......	(2,740)												
(23)	6 37 0 „	......	......	27·26	2,740	54·0	52·0	2·0	50·0								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) In Mr. Webster's garden, wind W.
(2) In Mr. Webster's garden, wind W.S.W.; cloudy.
(3) Left the earth. (4) Passing over Derby.
(5) Moving due E.; cloudy sky. Over the railway.
(6) Going towards Mansfield. (7) Over the Derwent; misty all round.
(8) Over meadows.
(9) The car has turned half round since leaving the earth; can see people as specs.
(10) Can see sheep; scud above; cannot see people in the fields; gas very nearly clear.
(11) Lowering the grapnel; wind felt in the face; can only see people on the roads.
(12) Four miles from Derby. (13) Derby in mist.
(14) Gas thick and cloudy issuing from the valve; clouds under us.
(15) Clouds around us; gas issuing from the neck of the balloon; earth misty.
(16) Entering cloud.
(17) In a white cloud; fog; can see nothing; clouds blacker above than below; gas muddy looking; warm. (18) Can hear watch ticking plainly.
(19) Heard a railway train.
(20) At $6^h 31^m 30^s$ at 3938 feet. Mr. Goodchild's pulsations were 90 in a minute; Mr. Allport's the same; Master Glaisher's 86; Mr. Jackson's and Mr. Coxwell's 94; Mr. Glaisher's 96; Mr. Knight's 110; and Mr. Bourne's 112.
Over Ilkeston, or about 10 miles from Derby; saw ten furnaces, &c.; counted ten bridges over the river. (21) Gas clear; heard shouting; can see men, sheep, &c.
(22) Gas bright. (23) Can see Nottingham.

Table I.—Meteorological Observations made in the Twentieth Balloon Ascent, from Derby, June 20, 1864.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicaee Blackened Bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	6 37 30 p.m.	......	......	27·26	2,740	54·0	52·1	1·9	50·2								
	6 38 0 „	......	......	27·18	2,820	53·9	51·2	2·7	48·5	......	......	......	......	......	......	48·0	
	6 39 0 „	......	......	27·11	2,890	54·0	52·0	2·0	50·0								
	6 39 30 „	......	......	27·06	2,940	54·0	51·7	2·3	49·5								
(1)	6 40 0 „	......	......	27·01	2,990	53·9	51·5	2·4	49·1								
	6 40 30 „	......	......	27·01	2,990	54·0	51·5	2·5	49·1								
(2)	6 41 0 „	......	......	26·95	3,050	54·0	51·5	2·5	49·1								
	6 42 0 „	......	......	26·88	3,120	54·0	51·5	2·5	49·1								
(3)	6 43 0 „	......	......	26·78	3,237	54·0	51·5	2·5	49·1								
(4)	6 44 0 „	......	......	26·47	3,549	53·5	52·0	1·5	50·5								
(5)	6 45 0 „	......	......	26·36	3,669	53·0	50·5	2·5	48·0								
(6)	6 45 10 „																
	6 45 30 „	......	......	26·27	3,758	52·2	49·5	2·7	46·7								
	6 46 0 „	......	......	26·26	3,768	51·0	50·0	1·0	49·0								
(7)	6 46 30 „																
	6 47 0 „	......	......	26·27	3,759	51·5	50·0	1·5	48·5								
(8)	6 47 30 „	......	......	......	(3,886)												
	6 48 0 „	......	......	26·02	4,013	50·7	49·8	0·9	48·8								
	6 49 0 „	......	......	25·91	4,123	50·2	49·2	1·0	48·1								
	6 49 30 „	......	......	25·81	4,230	50·0	49·2	0·8	48·3								
	6 50 0 „	......	......	25·78	4,271	49·2	49·2	0·0	49·2	......	......	......	......	......	......	49·0	
	6 50 30 „	......	......	25·78	4,271	49·2	49·2	0·0	49·2								
(9)	6 51 0 „	......	......	25·78	4,271	49·2	49·2	0·0	49·2								
(10)	6 51 30 „	......	......	......	(4,276)	......	......										
	6 52 0 „	......	......	25·77	4,280	49·5	49·0	0·5	48·5								
	6 52 30 „	......	......	......	(4,255)	......		......	......	......	......	......	......	......	......	47·5	
	6 53 0 „	......	......	25·81	4,230	49·5	48·2	1·3	46·8								
	6 53 30 „	......	......	25·81	4,230	49·5	48·1	1·4	46·6								
(11)	6 54 0 „	......	......	25·86	4,180	49·5	48·1	1·4	46·6								
(12)	6 54 30 „	......	......	25·91	4,130	49·2	48·1	1·1	46·8								
	6 54 45 „	......	......	25·91	4,130	49·3	48·1	1·2	46·8								
(13)	6 55 30 „	......	......	26·07	4,080	49·5	48·1	1·4	*46·6								
(14)	6 56 0 „	......	......	26·56	3,390	51·2	49·5	1·7	47·7	......	......	......	......	......	......	47·0	
(15)	6 56 30 „																
(16)	6 57 0 „	......	......	26·68	3,360	51·5	50·0	1·5	48·5								
	6 57 30 „	......	......	26·84	3,187	52·0	51·5	0·5	51·0								
	6 58 0 „	......	......	27·27	2,696	57·5	53·2	4·3	49·3								
	6 59 0 „	......	......	27·28	2,688	58·0	54·8	3·2	52·0								
	7 0 0 „	......	......	27·56	2,493	58·0	55·0	3·0	52·3								
	7 1 0 „	......	......	28·01	2,088	59·3	54·8	4·5	51·0								
	7 2 0 „	......	......	28·78	1,388	60·4	56·2	4·2	52·6								
	7 3 0 „	......	......	28·96	1,061	61·8	57·5	4·3	53·9								
(17)	7 16 0 „																
	7 25 0 „	......	......	29·58	......	64·6	58·5	6·1	53·4								
	7 30 0 „	......	......	29·78	......	64·0	58·2	5·8	53·9								
1.		2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Gas clear.
(2) Nottingham race-course and Burford seen. Gas coming out fast from the neck of the balloon. Nottingham appeared covered with smoke; moving towards Sherwood Forest.
(3) Over railway.
(4) Mist below; can see the earth clearly.
(5) Black mist below.
(6) Lost sight of the earth on entering cloud; clouds apparently blacker below than above; gas getting cloudy.
(7) Can hear sounds.
(8) Gas much cloudier; lighter; gas coming out of the neck of the balloon; light all round; gas thick.
(9) Heard a gun; still in cloud.
(10) The number of pulsations per minute were as follows:—Mr. Coxwell, 94; Mr. Bourne, 98; Mr. Goodchild, 86; Mr. Allport, 84; Mr. Jackson, 96; Mr. Knight, 90.
(11) Valve opened; slight wind against the face.
(12) Can hear a church-clock striking; clouds darker.
(13) Can see the earth; over fields.
(14) Earth clear; can see the edges of the clouds; cannot see people.
(15) Can see people; over a park; going over Southwell.
(16) Over Nottingham and Lincoln Railway; see sun faintly.
(17) On the ground at Nowell Woodhouse, about 9 miles from Newark.

Table I.—Meteorological Observations made in the Twenty-first Balloon Ascent, from the Crystal Palace, June 27, 1864.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened Bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	6 31 0 p.m.	......	......	29·75	ground	63·1	55·5	7·6	49·1	......	......	......	......	......	......	45·6	
	6 33 0 „	......	......	29·75	ground	64·0	56 +	......	49·4								
	6 33 30 „	......	......	29·75	ground	63·0	54·0	9·0	46·4								
	6 34 0 „	......	......	29·67	432	61·5	52·0	9·5	43·7								
(2)	6 34 30 „	......	......	29·64	484	62·0	52·1	9·9	43·6								
	6 34 45 „	......	......	29·61	514	60·1	51·2	8·9	43·4								
	6 35 0 „	......	......	29·51	610	60·1	51·3	8·8	43·5	......	......	......	......	......	......	......	59·2
	6 35 50 „	......	......	29·38	719	59·5	51·2	8·3	43·9	......	......	......	......	......	......	......	59·0
(3)	6 37 0 „	......	......	29·21	865	58·5	50·2	8·3	42·8	......	......	......	......	......	......	......	58·0
(4)	6 38 0 „	......	......	29·08	970	58·0	50·0	8·0	42·8								
(5)	6 38 30 „	......	......	28·98	1,054	57·8	50·0	7·8	43·0	......	......	......	......	......	......	......	57·0
	6 39 0 „	......	......	28·88	1,138	57·2	49·5	7·7	42·5								
	6 40 0 „	......	......	28·81	1,188	57·2	50·0	7·2	43·4								
	6 42 0 „	......	......	28·56	1,493	56·8	50·0	6·8	43·8								
	6 42 30 „	......	......	29·55	1,497	56·5	50·0	6·5	44·0	......	......	......	......	......	......	......	55·0
(6)	6 43 0 „	......	......	28·55	1,497	56·2	49·8	6·4	43·8								
	6 47 0 „	......	......	29·18	891	57·0	51·0	6·0	45·5								
(7)	6 48 0 „	......	......	29·24	840	57·2	51·5	5·7	46·3								
(8)	6 48 30 „	......	......	29·35	750	57·8	51·9	5·9	46·7								
	6 49 0 „	......	......	29·36	747	57·9	52·0	5·9	46·7								
	6 49 10 „	......	......	29·40	717	...	......	......	...	......	......	......	......	......	......	......	56·8
	6 49 20 „	......	......	29·38	714	58·0	51·5	6·5	43·8								
(9)	6 49 30 „	......	......	29·37	713	57·8	51·2	6·6	45·3								
(10)	6 50 0 „	......	......	29·24	841	57·5	50·9	6·6	45·1								
(11)	6 50 30 „	......	......	29·17	903												
	6 51 30 „	......	......	......	(980)	57·2	50·5	6·7	44·5								
(12)	6 52 0 „	......	......	29·05	1,019	57·0	50·3	6·7	44·2	......	......	......	......	......	......	......	55·9
(13)	6 53 0 „	......	......	28·74	1,309	56·2	50·0	6·2	44·8								
(14)	6 54 30 „	......	......	28·45	1,589	55·5	48·9	6·6	43·7								
	6 54 45 „	......	......	28·41	1,621	55·2	48·9	6·3	42·9								
(15)	6 56 0 „	......	......	28·38	1,660	55·2	48·2	7·0	41·5								
	6 56 30 „	......	......	28·37	1,670	54·9	48·2	6·7	43·2								
	6 59 30 „	......	......	28·81	1,188	55·0	49·2	5·8	43·6								
	7 1 0 „	......	......	29·06	950	55·2	49·2	6·0	43·4								
	7 1 30 „	......	......	28·98	1,004	56·0	49·5	6·5	43·4								
(16)	7 2 0 „	......	......	28·86	1,134	55·9	49·0	6·9	42·5								
(17)	7 2 30 „	......	......	28·64	1,370	55·2	49·2	6·0	43·4								
(18)	7 3 0 „	......	......	28·56	1,460	55·0	48·5	6·5	42·2								
(19)	7 3 30 „	......	......	28·51	1,514	54·5	48·0	6·5	41·7	......	......	......	......	......	......	......	54·0
(20)	7 4 0 „	......	......	28·45	1,578	54·0	47·8	6·6	41·7	......	......	......	......	......	......	......	53·5
	7 4 30 „	......	......	28·31	1,714	53·2	46·8	6·4	40·4								
(21)	7 5 0 „	......	......	28·05	1,979	52·7	46·1	6·6	39·6								
	7 5 30 „	......	......	28·00	2,026	52·2	46·1	6·1	39·9								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Sky cloudy; cirrocumulus; wind N.N.W. (2) Misty.
(3) Over Penge. (4) Going towards Bromley.
(5) Over Chatham and Dover line of railway.
(6) The number of pulsations per minute were as follows:—Mr. E. Atkinson, 78; Mr. Glaisher, 104; Mr. Ingelow, 108; Mr. Collins, 108; and Mr. Woodroffe, 120.
(7) Over Shortlands.
(8) Can see the fountains playing at the Crystal Palace.
(9) See New Church at Bromley. (10) Passing south of Bromley.
(11) Thirty vibrations of horizontal magnet in 48 seconds.
(12) On a level with Bromley.
(13) Going over Hayes Common.
(14) Crystal Palace looks well.
(15) The number of respirations per minute were as follows:—Mr. Collins, 11; Mr. Coxwell, 15; Mr. J. and Mr. E. Atkinson, both 17; Mr. Ingelow, 18; Mr. Glaisher, 18½; Mr. Woodroffe, 19; and Mr. Ellis, 20. Mr. Collins repeated the experiments and found them still the same.
(16) Ozone-paper tinged to 1; ozone-powder coloured to 2.
(17) Can feel wind in the face. (18) Passing down the Sevenoaks road.
(19) Moving S.E. (20) Sun at edge of cloud.
(21) Sun visible.

Table I.—Meteorological Observations made in the Twenty-first Balloon Ascent, from the Crystal Palace, June 27, 1864.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.
	h m s	in.	°	in.	feet.	°	°
	7 6 0 p.m.	......	......	27·97	2,057	52·2	46·1
(1)	7 6 30 „	......	......	27·75	2,295	51·5	46·0
	7 7 30 „	......	......	27·41	2,603	50·5	45·1
	7 8 0 „	......	......	27·36	2,648	49·5	45·0
	7 9 0 „	......	......	27·08	2,941	49·6	45·0
	7 9 30 „	......	......	27·00	3,021	49·2	45·2
	7 10 0 „	......	......	26·91	3,111	49·5	45·2
	7 10 30 „	......	......	26·81	3,202	49·5	45·1
	7 10 45 „	......	......	26·56	3,454	48·4	43·5
	7 11 0 „	......	......	26·27	3,767	46·9	43·0
	7 11 30 „	......	......	26·17	3,831	46·5	42·1
	7 12 0 „	......	......	26·11	3,871	46·2	42·1
	7 13 0 „	......	......	26·01	3,965	45·9	42·1
	7 14 0 „	......	......	25·96	4,017	45·5	42·1
	7 15 0 „	......	......	25·88	4,086	44·2	41·1
	7 16 0 „	......	......	25·91	4,131	43·1	40·5
	7 17 0 „	......	......	25·91	4,131	43·0	40·0
(2)	7 18 0 „	......	......	26·00	4,040	43·0	40·5
	7 18 30 „	......	......	26·06	3,985	43·1	40·5
	7 19 0 „	......	......	26·11	3,845	......	......
	7 19 20 „	......	......	26·25	3,795	43·1	40·5
	....	......	......	26·26	3,790	43·9	41·0
	7 20 0 „	......	......	26·37	3,680	44·0	42·0
	7 20 30 „	......	......	26·41	3,640	44·1	41·9
	....	......	......	26·41	3,640	44·2	42·1
(3)	7 21 0 „	......	......	26·46	3,590		
	7 22 0 „	......	......	26·51	3,511	44·8	42·1
(4)	7 22 15 „	......	......	26·54	3,487	44·5	43·1
	7 22 30 „	......	......	26·57	3,453	43·2	42·1
	7 24 0 „	......	......	26·57	3,453	45·2	42·5
	7 25 0 „	......	......	26·61	3,423	45·9	43·0
(5)	7 26 0 „	......	......	26·71	3,322	47·2	......
(6)	7 26 30 „	......	......	26·73	3,302	47·2	44·5
	7 27 0 „	......	......	26·76	3,277	47·5	45·0
	7 28 0 „	......	......	26·85	3,187	47·5	44·1
(7)	7 29 0 „	......	......	26·86	3,197	47·8	44·2
	7 30 0 „	......	......	26·90	3,119	47·5	43·7
	7 31 0 „	......	......	26·81	3,209	47·2	42·1
(8)	7 32 0 „	......	......	26·61	3,415	47·0	42·2
	7 33 0 „	......	......	26·48	3,527	47·0	42·2
(9)	7 34 0 „	......	......	26·44	3,561	46·5	42·1
(10)	7 34 30 „	......	......	......	(3,734)		
(11)	7 35 0 „	......	......	26·06	3,907	43·0	41·3
	7 35 30 „	......	......	25·86	4,191	42·8	41·5
(12)	7 36 0 „	......	......	25·78	4,270	43·0	42·0
(13)	7 37 0 „	......	......	25·61	4,467	43·0	42·0
	7 38 0 „	......	......	25·41	4,661	43·7	41·5
	7 39 0 „	......	......	25·36	4,716	43·0	41·3
		1.	2.	3.	4.	5.	6.	7.

Time.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened Bulb Thermometer.
h m s	°	°	°	°	°	°	°	°	°	°
7 6 0 p.m.	6·1	39·9								
7 6 30	5·5	41·2								
7 7 30	5·4	40·3								
7 8 0	4·5	40·2								
7 9 0	4·6	40·1								
7 9 30	4·0	40·9								
7 10 0	4·3	40·6								
7 10 30	4·4	40·4								
7 10 45	3·9	38·1								
7 11 0	3·9	38·6								
7 11 30	4·4	37·1								
7 12 0	4·1	37·4	......	......	......	......	......	......	39·2	45·0
7 13 0	3·8	37·7								
7 14 0	3·4	38·2								
7 15 0	3·1	37·5								
7 16 0	2·6	37·4								
7 17 0	3·0	36·4	......	......	......	......	......	......	34·5	
7 18 0	2·5	37·4								
7 18 30	2·6	37·4								
7 19 0	......	......	......	......	......	......	......	......	......	42·0
7 19 20	2·6	37·4								
....	2·9	37·6								
7 20 0	2·0	39·6								
7 20 30	2·2	39·3								
....	2·1	39·6								
7 21 0										
7 22 0	2·7	38·8								
7 22 15	1·4	41·3								
7 22 30	1·1	40·8								
7 24 0	2·7	39·4								
7 25 0	2·9	39·7								
7 26 0	......	......	......	......	......	......	......	......	......	45·0
7 26 30	2·7	41·5								
7 27 0	2·5	42·2								
7 28 0	3·4	42·4								
7 29 0	3·6	40·2								
7 30 0	3·8	39·4								
7 31 0	5·1	36·4								
7 32 0	4·8	36·8								
7 33 0	4·8	36·8								
7 34 0	4·4	37·1								
7 34 30										
7 35 0	1·7	39·2								
7 35 30	1·3	40·2								
7 36 0	1·0	40·8								
7 37 0	1·0	40·8								
7 38 0	2·2	38·8								
7 39 0	1·7	39·2								
	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Near New Bromley. (2) Golden tinge over water. (3) Sun again seen.
(4) Thirty vibrations of horizontal magnet was observed in 49·1 seconds.
(5) Sun shining on Blackened Bulb Thermometer.
(6) Can see Farningham; passing Madamscourt Hill.
(7) Thirty vibrations of horizontal magnet was observed in 49 seconds.
(8) Thirty vibrations of horizontal magnet was observed in 48·9 seconds.
(9) Sevenoaks on our level. (10) Crossing Sevenoaks line.
(11) Can see Knoll House.
(12) Ozone by paper was coloured to 2, that by powder 3.
(13) Thirty vibrations of horizontal magnet was observed in 49·2 seconds.

Table I.—Meteorological Observations made in the Twenty-first Balloon Ascent, from the Crystal Palace, June 27, 1864.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Diff.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened Bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	7 39 30 p.m.	......	......	25.28	4,796	44.1	40.2	3.9	35.6	......	......	......	......	......	......	......	41.5
(1)	7 40 0 „	......	......	25.18	4,898	42.9	41.2	1.7	39.1								
	7 41 0 „	......	......	25.18	4,898	42.8	41.0	1.8	38.8								
	7 41 30 „	......	......	25.18	4,898	42.2	40.5	1.7	38.4								
	7 42 0 „	......	......	25.26	4,816	41.9	39.8	2.1	37.1								
	7 42 30 „	......	......	25.28	4,796	42.2	39.9	2.3	37.0								
	7 42 45 „	......	......	25.36	4,722	41.9	38.5	3.4	34.3								
(2)	7 43 0 „	......	......	25.38	4,699	41.2	38.5	2.7	35.1								
(3)	7 44 0 „	......	......	25.45	4,597	41.2	38.5	2.7	35.1								
(4)	7 44 30 „	......	......	25.45	4,597	40.2	37.8	2.4	34.7								
(5)	7 45 0 „	......	......	25.38	4,699	40.2	37.8	2.4	34.7								
(6)	7 46 0 „	......	......	25.36	4,692	40.2	37.8	2.4	34.7								
	7 48 0 „	......	......	25.45	4,597	40.9	38.2	2.7	34.7								
	7 49 0 „	......	......	25.55	4,492	40.9	38.2	2.7	34.7								
(7)	7 49 20 „	......	......	25.57	4,471	41.0	38.2	2.8	34.7								
(8)	7 49 30 „	......	......	25.57	4,471	41.0	38.2	2.8	34.7								
	7 50 0 „	......	......	25.68	4,357	41.0	38.2	2.8	34.7								
(9)	7 51 0 „	......	......	25.91	4,115	41.2	38.5	2.7	35.1								
(10)	7 52 30 „	......	......	26.06	3,958	42.0	38.2	3.8	33.5								
(11)	7 53 0 „	......	......	......	(3,958)	42.0	38.0	4.0	33.1	......	......	......	......	......	......	......	41.5
	7 53 30 „	......	......	26.06	3,958	42.0	38.9	3.1	35.0								
(12)	7 53 45 „	......	......	26.06	3,958	41.9	39.0	2.9	35.4								
(13)	7 54 0 „	......	......	26.06	3,958	41.9	39.2	2.7	35.9								
	7 54 30 „	......	......	26.08	3,936	41.9	39.0	2.9	35.4								
	7 55 30 „	......	......	26.06	3,958	41.9	39.0	2.9	35.4								
	7 56 0 „	......	......	26.06	3,958	41.5	39.5	2.0	37.0								
(14)	7 56 30 „	......	......	26.08	3,936	41.5	39.0	2.5	36.9								
(15)	7 57 30 „	......	......	......	(3,686)												
	7 58 0 „	......	......	26.36	3,637	41.9	39.5	2.4	36.6								
(16)	7 58 30 „	......	......	26.41	3,588	42.0	39.2	2.8	35.7								
	7 59 0 „	......	......	26.45	3,547	41.9	39.8	2.1	37.1								
(17)	8 0 0 „	......	......	26.48	3,604	41.9	39.8	2.1	37.1								
(18)	8 0 30 „	......	......	26.55	3,450	42.1	39.8	2.3	36.9								
(19)	8 1 0 „	......	......	26.66	3,343	42.1	40.0	2.1	37.4								
	8 1 30 „	......	......	26.76	3,244	42.5	40.0	2.5	37.0								
	8 2 30 „	......	......	26.86	3,144	42.5	40.5	2.0	38.0								
(20)	8 3 0 „	......	......	26.96	3,044	42.5	40.5	2.0	38.0								
(21)	8 3 30 „	......	......	27.01	2,994	43.0	41.0	2.0	38.6	......	......	......	......	......	......	......	44.0
(22)	8 4 0 „	......	......	27.26	2,744	43.5	41.0	2.5	38.0								
	8 5 0 „	......	......	27.31	2,694	44.0	41.5	2.5	38.5								
(23)	8 6 0 „	......	......	27.41	2,594	44.5	42.0	2.5	39.0								
(24)	8 7 0 „	......	......	27.56	2,440	44.9	42.0	2.9	38.6								
	8 8 0 „	......	......	27.58	2,409	44.9	42.0	2.9	38.6								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Over the Weald of Kent; temperature of gas in balloon 55°.
(2) Very misty; no object at any distance can be seen.
(3) Thirty vibrations of horizontal magnet in 49·2 seconds.
(4) The sky clear and light blue; detached cumuli.
(5) Heard dog barking; passing to the left of Tunbridge.
(6) Thirty vibrations of horizontal magnet in 49 seconds.
(7) Very misty. (8) Very misty.
(9) Ozone paper coloured to 3, powder to 4.
(10) Can see Tunbridge Wells to the right and S. of us.
(11) Can hear voices, but see no one on the earth.
(12) The sun at edge of cloud. (13) Near village of Hadlow.
(14) Nearly over the Medway.
(15) Thirty vibrations of horizontal magnet in 49 seconds.
(16) We are changing our direction. (17) Heard a gun.
(18) Can see main line of the South-Eastern Railway; a train coming towards us.
(19) Can see people. (20) Belt across the sun apparently on our level.
(21) Can see two horses, and a man leading them.
(22) Thirty vibrations of horizontal magnet in 48·7 seconds.
(23) Heard a gun; can see three trains.
(24) Can just see the edge of the sun.

TABLE I.—Meteorological Observations made in the Twenty-first Balloon Ascent, from the Crystal Palace, June 27, 1864.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Att. Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Wet.	Diff.	Dew-point.	Hygrometers. Daniell's. Dew-point.	Regnault's. Dew-point.	Delicate Blackened Bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	8 8 30 p.m.	......	......	27·46	2,529	45·0	42·2	2·8	38·9								
(2)	8 9 30 „	......	......	27·06	2,929	45·2	42·3	2·9	38·9								
	8 10 0 „	......	......	26·76	3,229	44·8	42·5	2·3	38·8								
	8 11 0 „	......	......	26·66	3,329	44·8	42·0	2·8	38·7								
	8 14 0 „	......	......	26·51	3,479	43·9	41·5	2·4	38·6								
	8 15 0 „	......	......	26·41	3,579	43·5	41·0	2·5	38·0								
(3)	8 15 30 „	......	......	26·41	3,579	43·5	41·0	2·5	38·0								
	8 16 0 „	......	......	26·41	3,579	43·3	41·0	2·3	38·3								
(4)	8 17 0 „	......	......	26·56	3,444	43·1	40·5	2·6	37·4								
(5)	8 18 0 „	......	......	26·66	3,340	43·0	40·1	2·9	38·6								
	8 19 0 „	......	......	26·71	3,288	43·1	40·5	2·6	37·4								
	8 20 0 „	......	......	26·76	3,236	43·2	40·5	2·7	37·3								
	8 20 30 „	......	......	27·01	2,978	43·5	40·8	2·7	37·6								
	8 20 45 „	......	......	27·01	2,978	43·5	41·5	2·0	39·2								
	8 21 0 „	......	......	27·01	2,978	43·5	41·2	2·3	38·4								
	8 22 0 „	......	......	27·11	2,878	43·8	41·2	2·6	38·1								
(6)	....	......	......	27·16	2,828	44·0	41·5	2·5	38·5								
	8 23 0 „	......	......	27·16	2,828	44·0	42·0	2·0	39·6								
	8 24 0 „	......	......	27·26	2,720	44·2	42·0	2·2	39·4								
(7)	8 25 0 „	......	......	27·27	2,710	44·5	42·2	2·3	39·4								
	8 26 0 „	......	......	27·56	2,434	45·2	43·2	2·0	40·9								
	8 27 0 „	......	......	27·66	2,337	45·0	43·0	2·0	40·7								
	8 27 30 „	......	......	27·71	2,289	45·9	43·0	2·9	39·7								
	8 28 0 „	......	......	27·76	2,241	46·0	43·9	2·1	41·5								
(8)	8 28 20 „	......	......	27·78	2,221	46·0	43·5	2·5	40·6								
	8 28 30 „	......	......	27·81	2,199	46·2	44·0	2·2	41·5								
	8 29 0 „	......	......	27·96	2,151	46·2	44·0	2·2	41·5								
(9)	8 29 30 „	......	......	28·01	2,003	47·0	44·1	2·9	40·8								
	8 29 45 „	......	......	28·06	1,955	47·0	44·1	2·9	40·8								
	8 30 0 „	......	......	28·08	1,937	47·2	44·2	3·0	40·8								
	8 30 15 „	......	......	28·08	1,937	47·1	44·2	2·9	40·9								
	8 30 30 „	......	......	28·15	1,910	47·5	44·2	3·3	40·5								
	8 31 0 „	......	......	28·18	1,831	47·5	44·2	3·3	40·5								
(10)	8 32 0 „	......	......	28·18	1,831	47·7	44·7	3·0	41·4								
	8 32 30 „	......	......	28·16	1,884	47·9	44·6	3·3	40·9								
	8 32 45 „	......	......	28·16	1,884	48·0	44·5	3·5	40·6								
(11)	8 33 0 „	......	......	28·11	1,936	48·2	44·7	3·5	40·8								
(12)	8 33 30 „	......	......	28·06	1,988	48·2	44·9	3·3	41·2								
	8 34 0 „	......	......	27·95	2,098	47·8	44·5	3·3	40·8								
	8 35 30 „	......	......	27·88	2,168	47·8	44·2	3·6	40·2								
(13)	8 36 0 „	......	......	27·84	2,208	47·9	44·0	3·9	39·7								
	8 36 30 „	......	......	27·78	2,268	47·8	44·0	3·8	39·8								
	8 37 0 „	......	......	27·76	2,288	47·6	44·0	3·6	40·0								
	8 37 30 „	......	......	27·68	2,322	47·6	44·2	3·4	40·4								
	8 38 0 „	......	......	27·66	2,337	47·2	43·9	3·3	40·2								
	8 38 15 „	......	......	27·64	2,348	47·2	43·9	3·3	40·2								
	8 38 30 „	......	......	27·64	2,348	47·2	44·0	3·2	40·4								
(14)	8 39 0 „	......	......	27·66	2,337	47·2	43·7	3·5	39·8								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Heard the whistle of a train.
(2) Sixteen vibrations of horizontal magnet in 26·5 seconds.
(3) Lowered grapnel; clear sky above.
(4) Going over Goudhurst. (5) Sunset.
(6) We are passing between Hawkhurst and Cranbrook.
(7) Thirty vibrations of horizontal magnet in 48·5 seconds.
(8) Cranbrook very distinct. (9) Sounds very distinctly heard.
(10) The country is very beautiful indeed.
(11) A bell heard with a clear sound. (12) The shades of evening are coming over.
(13) Over Tenterden. (14) Heard a gun.

Table I.—Meteorological Observations made in the Twenty-first Balloon Ascent, from the Crystal Palace, June 27, 1864.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermo-meter.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	8 39 30 p.m.	......	......	27·66	2,337	47·2	43·5	3·7	39·3								
	8 39 45 „	......	......	27·66	2,337	47·2	43·5	3·7	39·3								
	8 40 0 „	......	......	27·81	2,187	47·0	43·5	3·5	39·5								
	8 41 0 „	......	......	27·86	2,136	47·0	43·6	3·4	39·7								
	8 41 30 „	......	......	27·91	2,086	47·0	43·7	3·3	39·9								
	8 42 0 „	......	......	27·94	2,056	47·3	43·9	3·4	40·1								
	8 42 30 „	......	......	28·01	1,986	47·2	43·9	3·3	40·2								
(1)	8 43 0 „	......	......	28·16	1,836	47·0	44·0	3·0	40·6								
	8 43 30 „	......	......	28·21	1,786	47·2	44·5	2·7	41·4								
	8 44 0 „	......	......	28·28	1,716	47·5	45·1	2·4	43·4								
	8 44 30 „	......	......	28·28	1,716	47·8	44·8	3·0	41·4								
(2)	8 45 0 „	......	......	28·35	1,668	48·2	44·5	3·7	40·4								
	8 45 30 „	......	......	28·36	1,678	48·5	45·2	3·3	41·6								
	8 46 0 „	......	......	28·41	1,628	48·7	45·1	3·6	41·2								
	8 47 0 „	......	......	28·42	1,618	48·9	45·5	3·4	41·8								
(3)	8 48 0 „	......	......	......	(1,478)	49·1											
	8 50 0 „	......	......	28·84	1,198	49·0	45·5	3·5	41·7								
(4)	8 51 0 „	......	......	28·91	1,114	49·0	44·2	4·8	39·0								
	8 51 30 „	......	......	28·91	1,114	49·0	44·0	5·0	38·6								
	8 52 0 „	......	......	28·98	1,030	49·0	43·9	5·1	38·4								
	8 52 30 „	......	......	29·06	944	49·0	43·5	5·5	37·5								
	8 53 0 „	......	......	29·06	944	49·0	43·2	5·8	36·9								
	8 54 0 „	......	......	29·21	770	49·0	43·5	5·5	37·5								
	8 54 15 „	......	......	29·21	770	49·0	44·0	5·0	38·6								
	8 54 30 „	......	......	29·26	662	49·0	44·0	5·0	38·6								
	8 55 0 „	......	......	29·23	698	48·8	43·8	5·0	38·3								
	8 55 30 „	......	......	29·16	772	48·9	43·5	5·4	37·8								
	8 56 0 „	......	......	29·06	890	48·9	43·5	5·4	37·8								
	8 56 30 „	......	......	28·91	949	48·6	43·2	5·4	37·3								
	8 57 0 „	......	......	28·66	1,245	48·8	42·8	6·0	36·2								
	8 57 30 „	......	......	28·56	1,363	48·5	42·3	6·2	35·5								
	8 58 0 „	......	......	28·41	1,540	47·9	42·2	5·7	35·9								
	8 58 30 „	......	......	28·31	1,658	47·0	42·0	5·0	36·4								
	8 59 0 „	......	......	28·26	1,717	46·5	41·8	4·7	36·4								
	8 59 30 „	......	......	28·16	1,843	46·0	40·6	5·4	34·4								
	9 0 15 „	......	......	27·36	2,651	47·2	41·0	6·0	34·1								
	9 1 0 „	......	......	27·06	2,954	47·5	42·2	5·3	36·3								
	9 1 30 „	......	......	26·78	3,244	46·5	42·7	3·8	38·4								
	9 2 0 „	......	......	26·81	3,214	46·7	42·5	4·2	37·7								
	9 3 0 „	......	......	26·31	3,517	46·9	41·5	5·4	35·4								
(5)	9 3 30 „	......	......	26·06	3,964	46·0	41·2	4·8	35·7								
(6)	9 4 0 „	......	......	25·91	4,019	44·8	40·5	4·3	35·5								
	.... „	......	......	25·78	4,166	44·5											
	9 6 0 „	......	......	25·06	4,956												
	9 7 0 „	......	......	24·66	5,396												
(7)	9 8 0 „	......	......	24·06	6,168												
(8)	9 21 0 „																
(9)	9 30 0 „	......	......	29·96	ground	46·5	45·2	1·3	43·8								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Gas clear. (2) Mist over marshes.
(3) Packed up the Hygrometer and Blackened Bulb Thermometer.
(4) Still over Tenterden; came within the influence of a westerly current.
(5) Difficult to read the instruments.
(6) In fog.
(7) Could not see to read the instruments.
(8) On the ground at Romney Marsh, about half a mile from Cheynecourt.
(9) At the Alliance Inn, Brookland, at midnight, Mr. Coxwell's pulsations were 90 in a minute; Mr. Glaisher's 88; Mr. Collins's 94, and Mr. J. Atkinson's 74. The number of respirations per minute were—Mr. Coxwell, 18; Mr. Glaisher 17, and Mr. Collins 15. At the hour of 1h a.m., June 28, 30 vibrations of the same horizontal magnet were observed, as follows:—in 47·2; again 47·2; again 47·2; again 46·5; and in 47·2 seconds.

Table I.—Meteorological Observations made in the Twenty-second Balloon Ascent, from the Crystal Palace, August 29, 1864.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	4 6 0 p.m.	......	......	29·64	ground.	72·5	57·0	15·5	45·4								
(1)	4 6 20 „																
	4 7 0 „	......	......	29·54	444	72·0	57·0	15·0	45·7								
	4 7 30 „	......	......	29·26	769	71·2	57·2	14·0	46·7								
	4 8 0 „	......	......	28·49	1,484	71·0	56·0	15·0	45·2								
	4 8 30 „	......	......	28·10	1,883	68·2	55·5	12·7	45·6	......	......	......	......	......	......	......	70·0
	4 9 0 „	......	......	27·54	2,433	64·5	53·0	11·5	43·6	......	......	......	......	......	......	......	64·5
	4 10 0 „	......	......	26·84	3,166	62·2	51·0	11·2	41·4								
	4 10 30 „	......	......	26·59	3,427	61·0	49·5	11·5	39·5								
	4 11 0 „	......	......	26·34	4,034	60·5	48·5	12·0	38·0								
	4 11 30 „	......	......	26·09	4,644	58·5	47·2	11·3	37·1								
	4 12 0 „	......	......	25·79	5,370	56·2	46·2	10·0	36·9								
	4 13 0 „	......	......	25·80	5,347	55·0	46·0	9·0	37·4								
(2)	4 14 0 „	......	......	25·46	4,612	52·5	47·0	5·5	41·5								
	4 15 0 „	......	......	25·44	4,635	53·2	47·1	6·1	41·0								
(3)	4 16 0 „	......	......	25·36	4,730	54·2	49·2	5·0	44·3	......	......	......	......	......	.....	43·5	54·0
	4 17 0 „	......	......	25·29	4,808	54·3	49·2	5·1	44·2								
	4 17 30 „	......	......	25·06	5,066	54·2	48·5	5·7	42·9	......	......	......	......	......	......	......	54·8
	4 18 0 „	......	......	24·86	5,289	54·2	48·5	5·7	42·9								
(4)	4 19 0 „	......	......	24·53	5,664	54·2	51·0	3·0	47·9								
(5)	4 20 0 „	......	......	24·44	5,767	54·2	48·2	6·0	42·3	......	......	......	......	......	......	......	52·0
	4 23 30 „	......	......	23·79	6,513	51·2	45·0	6·2	38·6								
	4 24 0 „	......	......	23·49	6,858	51·2	45·0	6·2	38·6								
	4 24 30 „	......	......	......	(7,008)	......	......	......	......	......	......	......	......	......	......	33·0	
	4 25 0 „	......	......	23·24	7,158	51·2	44·1	7·1	37·1	......	......	......	......	......	......	38·0	
	4 26 0 „	......	......	22·96	7,496	51·0	42·5	8·5	33·6								
	4 26 30 „	......	......	22·89	7,578	50·2	40·5	9·7	30·2	......	......	......	......	......	......	29·5	52·0
(6)	4 27 0 „	......	......	22·54	7,994	48·9	38·9	10·0	28·1								
(7)	4 28 0 „																
(8)	4 28 30 „	......	......	22·34	8,224	45·0	37·2	7·8	28·1								
	4 28 45 „	......	......	22·14	8,454	44·2	37·1	7·1	28·7								
	4 29 0 „	......	......	22·04	8,568	43·2	36·5	6·7	28·5								
	4 29 30 „	......	......	21·92	8,719	43·2	36·0	7·2	27·4								
	4 30 30 „	......	......	21·44	9,322	42·0	36·2	5·8	29·0								
(9)	4 31 0 „	......	......	21·34	9,610	41·2	36·0	5·2	29·5								
	4 32 0 „	......	......	20·59	10,575	41·2	36·0	5·2	29·5								
	4 32 30 „	......	......	20·46	10,744	40·5	35·0	5·5	28·0								
(10)	4 33 0 „	......	......	20·36	10,875	40·2	34·8	5·4	27·8	......	......	......	......	......	......	25·0	
(11)	4 34 0 „	......	......	19·94	11,422	36·0	28·5	7·5	16·7								
	4 36 0 „	......	......	19·64	11,813	35·5	26·2	9·3	12·1								
	4 38 0 „	......	......	19·07	12,605	34·2	28·0	6·2	17·1								
	4 38 20 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	35·0
	4 39 0 „	......	......	18·94	12,773	32·8	27·2	5·6	16·0	......	......	......	......	......	......	12·0	35·2
	4 39 30 „	......	......	18·82	12,954	32·8	26·2	6·6	13·0								
(12)	4 39 45 „	......	......	18·84	12,924	33·2	25·5	7·7	10·0								
(13)	4 42 0 „	......	......	18·34	13,675	34·2	33·5										
(14)	4 44 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	42·0
(15)	4 45 0 „	......	......	......	(14,293)												
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Left the earth. (2) Balloon revolving once in 3 minutes. (3) No wind.
(4) Deep blue sky; horizon very misty; cirri above.
(5) Tried vibrations of a horizontal magnet, but failed.
(6) Changed direction to move west. (7) Moving quickly.
(8) Ships look small.
(9) Tried vibrations of horizontal magnet again, but failed.
(10) The fountains of the Crystal Palace look very small; ozone coloured to 1.
(11) Dreadnought looks small. (12) Applied water to Wet-bulb.
(13) Fountains at the Crystal Palace small. (14) Sun hot to the face.
(15) Thirty vibrations of a horizontal magnet in 42 seconds.

TABLE I.—Meteorological Observations made in the Twenty-second Balloon Ascent, from the Crystal Palace, August 29, 1864.

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened Bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Att. Therm.			Dry.	Wet.	Diff.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	4 46 0 p.m.	......	......	17.94	14,293	35.2	31.0	4.2	25.3								
	4 47 0 ”	......	......	17.94	14,293	35.2	30.7	4.5	23.5								
(1)	4 47 30 ”	......	......	17.92	14,317	35.5	30.5	5.0	22.8	......	......	......	......	......	......	......	42.0
	4 48 30 ”	......	......	17.84	14,415	33.2	31.1	2.1	27.0								
	4 49 0 ”	......	......	17.74	14,581	33.2	31.0	2.2	27.0								
	4 49 30 ”	......	......	17.74	14,581	34.2	30.9	3.3	25.1	......	......	......	......	......	......	......	35.5
(2)	4 50 0 ”	......	......	......	(14,580)												
	4 52 0 ”	......	......	17.89	14,330	33.0	30.5	2.5	25.5								
(3)	4 52 30 ”	......	......	17.92	14,281	33.0	30.0	3.0	24.0								
	4 53 0 ”	......	......	17.94	14,248	32.3	28.1	4.2	18.9								
	4 54 30 ”	......	......	18.04	14,086	32.0	26.1	5.9	22.5								
	4 55 0 ”	......	......	......	......	......	......	......	3.0	......	......	......	......	......	......	......	37.0
	4 56 0 ”	......	......	18.04	14,086	29.5	22.0	7.5	− 2.4	......	......	......	......	......	......	− 3.0	
(4)	4 57 0 ”	......	......	18.09	13,991	28.5	22.1	6.4	− 1.6								
(5)	4 58 0 ”	......	......	......	......	......	......	......	......	......	......	......	......	......	......	− 3.0	
	4 58 30 ”	......	......	18.14	13,895	29.0	22.0	7.0	− 3.4								
	4 59 0 ”	......	......	18.26	13,730	30.0	23.1	6.9	+ 1.4								
	5 0 0 ”	......	......	18.29	13,688	31.0	22.5	8.5	− 0.4								
	5 1 30 ”	......	......	18.74	13,016	30.0	22.0	8.0	− 3.2								
(6)	5 3 0 ”	......	......	18.84	12,866	31.0	22.7	8.3	+ 0.4	......	......	......	......	......	......	0.0	
	5 7 0 ”	......	......	20.64	9,943	34.0	28.9	5.1	20.0								
	5 7 30 ”	......	......	20.79	9,868	34.2	29.0	5.2	19.9								
	5 8 0 ”																
	5 9 0 ”	......	......	21.05	9,740	36.2	30.2	6.0	21.2	......	......	......	......	......	......	20.0	
	5 11 0 ”	......	......	21.42	9,268	36.2	30.5	5.7	22.0	......	......	......	......	......	......	......	42.0
	5 11 30 ”	......	......	21.52	9,143	37.2	30.5	6.7	31.1	......	......	......	......	......	......	......	43.0
	5 12 0 ”	......	......	21.65	8,981	37.8	30.9	6.9	31.7								
	5 14 0 ”	......	......	22.34	8,146	41.2	32.0	9.2	20.5								
	5 14 30 ”	......	......	22.69	7,726	41.5	31.8	9.7	19.7								
	5 15 0 ”	......	......	22.74	7,666	41.0	31.8	9.2	20.2								
	5 16 0 ”	......	......	23.00	7,351	42.5	32.0	10.5	19.2	......	......	......	......	......	......	19.0	51.0
	5 17 0 ”	......	......	23.29	7,018	44.2	33.5	10.7	20.9								
(7)	5 17 30 ”	......	......	23.69	6,558	45.5	38.1	7.4	29.6								
	5 18 0 ”	......	......	24.18	5,996	47.0	42.8	4.2	38.1								
	5 19 0 ”	......	......	25.26	4,815	49.5	46.2	3.3	43.0								
	5 20 0 ”	......	......	25.49	4,550	51.2	48.1	3.1	44.9								
	5 21 0 ”	......	......	25.70	4,326	52.5	48.1	4.4	43.6								
	5 22 0 ”	......	......	26.14	3,857	53.5	49.5	4.0	45.0								
	5 23 0 ”	......	......	26.74	3,225	54.2	49.1	5.1	44.1								
(8)	5 25 0 ”	......	......	26.74	3,238	58.2	49.5	8.7	41.6								
	5 26 0 ”	......	......	28.06	1,902												
	5 27 0 ”	......	......	28.54	1,417	64.0	55.0	9.0	47.5								
(9)	5 32 0 ”	......	......	29.86	on the ground	69.0	57.2	11.8	47.9								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Ozone paper coloured to 2; 28 vibrations of a horizontal magnet in 49.5 seconds.
(2) Mr. Glaisher's pulsations were 110, and respirations 20 in a minute.
(3) Mr. Glaisher's pulsations were 97 in a minute.
(4) Field appeared 20 feet square.
(5) Nearly over Erith.

(6) Mr. Glaisher's pulsations here were 99; Mr. Coxwell's 102; Messrs. Norris and Cranston each 118 in one minute. The number of respirations in one minute were as follows:— Mr. Norris, 10; Mr. Glaisher, 18; and Messrs. Coxwell and Cranston each 22.
(7) Over the edge of the River Thames. (8) Sand out.
(9) On the ground at Wybridge, near Rainham, in Essex.

§ 4. Adopted Temperatures of the Air and Dew-Point, with Height, in the Fourteenth to the Twenty-second Balloon Ascents.

From all the observations of the temperature and of the dew-point in the preceding Tables, a determination was made of both elements, with the corresponding readings of the barometer and heights. Some of the numbers in the column for heights have been interpolated when either of these elements have been observed without a corresponding observation of the barometer. The numbers thus found are within brackets. The results are contained in the following Tables.

Table II.—Showing the adopted Reading of the Barometer, calculated Height above the Sea, Temperatures of the Air, Wet-bulb, and the Dew-point, in the Fourteenth to the Twenty-second Balloon Ascents.—Fourteenth Ascent.—August 31, 1863.

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°
6 0 0	29·70	on the ground	64·0	60·0	56·7
6 0	29·70		64·0	60·0	56·7
7 0	29·70		64·0	60·0	56·7
12 0	29·55	196	56·0	54·0	52·1
13 0	29·30	422	56·0	53·5	51·1
14 0	28·80	874	55·5	53·0	50·6
14 20	28·64	1109	54·2	54·1	54·0
14 30	28·50	1145	53·5	51·2	48·5
15 40	27·70	1963	51·5	49·0	46·4
16 0	27·40	2270	50·5	48·5	46·4
17 0	27·00	2670	50·5	47·2	43·7
18 0	26·90	2770	47·8	45·1	42·3
18 30	26·42	3263	47·2	44·0	40·4
18 40	26·00	3694	46·0	42·1	37·6
18 50	25·92	3778	45·2	41·1	36·4
19 0	25·55	4167	45·2	40·5	35·0
20 0	25·30	4425	45·0	40·5	35·3
20 20	25·10	4632	43·5	38·8	33·7
20 30	24·85	4907	43·0	38·2	32·4
20 40	24·48	5403	42·0	37·1	31·1
21 10	24·00	5844	40·0	35·5	29·6
21 30	23·50	6404	37·0	32·5	26·1
22 0	23·30	6627	35·5	30·5	22·5
22 30	23·00	6963	35·0	29·0	19·4
23 0	22·95	7022	34·5	29·0	19·3
23 30	22·90	7080	34·0	28·5	18·0
24 0	22·70	7315	34·0	28·7	19·4
24 10	22·50	7549	33·9	28·5	19·0
25 0	22·50	7549	33·5	27·8	17·1
27 0	22·30	7790	34·0	28·5	18·8
27 50	22·30	7790	34·0	28·5	18·8
28 0	22·20	7912	34·0	28·5	18·8
28 30	22·20	7912	34·0	28·5	18·8
29 0	22·20	7912	34·0	28·5	18·8
29 30	22·10	8033	34·0	28·5	18·8
31 0	22·10	8033	34·0	28·5	18·8
32 0	22·20	7912	34·0	28·5	18·8
32 30	22·20	7912	34·0	28·5	18·8
33 0	22·35	7770	35·0	30·0	22·0
34 0	22·45	7621	36·0	32·0	26·0
35 30	22·70	7327	36·5	32·0	25·3
36 0	22·90	7124	37·2	33·1	27·3
37 0	23·00	7022	38·0	33·5	27·4
37 30	23·10	6898	38·5	34·2	28·4
38 30	23·32	6626	38·3	34·2	28·6
39 0	23·50	6404	38·2	34·2	28·8
6 40 0	23·65	6233	38·5	34·2	28·4
40 10	23·70	6176	38·5	34·5	29·0
42 0	23·95	5891	38·2	35·1	31·0
42 30	24·40	5389	38·5	35·0	30·3
43 0	24·40	5389	38·5	35·0	30·3
43 30	24·45	5339	38·5	34·8	29·8
44 30	24·92	3865	39·1	36·1	32·2
45 0	25·00	4784	39·5	37·2	34·3
45 30	25·30	4452	39·5	37·1	34·0
46 0	25·50	4231	40·5	37·8	34·8
46 15	25·70	4009	41·5	38·5	33·7
47 0	25·90	3787	42·1	40·5	38·5
47 30	26·20	3480	42·1	40·8	39·2
48 0	26·41	3264	42·8	41·2	40·9
48 10	26·65	3018	43·1	42·8	42·4
48 20	26·71	2957	43·8	42·1	40·3
49 0	26·90	2762	44·1	43·0	41·7
49 30	27·20	2466	45·3	44·1	42·9
49 45	27·35	2317	45·2	45·0	44·8
50 10	27·78	1803	46·8	46·2	45·2
51 0	27·95	1724	47·2	46·8	46·3
51 10	28·25	1434	47·9	47·0	46·1
51 30	28·50	1193	48·2	47·5	46·7
52 0	28·70	1003	49·0	48·2	47·3
53 0	28·85	859	49·8	49·0	48·1
53 10	28·90	812	....	....	48·0
53 20	28·90	812	50·5	50·0	45·5
53 30	28·75	1050	51·0	50·0	49·0
54 0	28·40	1287	51·0	50·5	50·0
54 10	28·10	1580	50·5	50·5	50·5
54 20	27·90	1775	50·5	49·8	48·6
54 30	27·72	1954	50·5	48·9	47·2
55 0	27·65	2024	49·8	48·5	47·1
55 30	27·63	1995	50·0	48·0	45·9
57 30	28·50	1200	50·5	50·0	49·5
58 0	28·53	1171	50·5	50·0	49·5
58 30	28·80	909	51·0	50·0	49·0
59 0	28·90	840	53·0	52·5	52·0
59 30	29·10	704	53·2	52·4	51·6
7 0 0	29·20	635	53·5	52·5	51·5
1 0	29·25	600	53·7	52·5	51·3
3 0	29·35	531	53·8		
5 0					
15 0	....	on the ground	53·5		
29 0	....		53·5		

Table II. (continued.)—Fifteenth Ascent.—September 29, 1863.

Time of observation. A.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°
7 12 0	29·436	on the ground	44·2	43·8	43·4
33 0	29·427		47·2	46·0	44·7
36 0	29·459		47·5	45·5	43·4
42 0	29·483		48·0	46·1	44·1
43 0	29·176	731	47·0	45·1	43·0
45 0	29·018	879	46·0	44·2	42·2
46 0	28·791	1092	45·2	44·1	42·9
46 30	28·644	1270	45·1	43·8	41·2
47 0	28·247	1853	45·1	43·0	40·7
47 50	28·049	2129	44·9	43·0	40·8
50 0	27·849	2197	44·9	43·0	40·8
52 0	26·950	2870	42·0	41·1	40·0
52 30	26·451	3278	41·5	39·0	35·9
54 0	26·154	3685	40·0	37·5	34·2
55 0	....	(3811)	38·5	36·5	33·7
56 0	25·859	3938	38·0	35·8	32·8
57 0	....	(4398)	37·5	35·0	31·6
59 0	24·619	5314	35·2	32·2	27·5
8 0 0	24·469	5473	33·8	31·1	28·6
1 0	24·270	5789	33·6	30·4	25·2
2 0	23·972	6000	32·2	29·8	24·4
3 0	23·783	6117	31·5	29·0	22·9
4 0	23·674	6321	31·3		....
4 30	....	(6375)	31·0	29·2	24·3
5 0	23·496	6429	30·5	29·0	25·9
6 0	23·528	6385	30·0	28·5	23·8
6 30	23·529	6385	30·5	28·7	25·7
7 0	23·531	6385	29·0	27·8	23·4
9 0	23·382	6647	29·5	27·8	24·7
10 0	23·362	6659	29·3	27·5	21·3
11 0	23·103	6966	29·0	27·1	20·3
11 30	22·884	7201	28·5	26·0	19·2
12 0	22·734	7436	28·0	25·7	16·2
13 0	22·485	7671	27·2	25·0	15·2
14 0	22·387	7806	26·0	24·1	14·4
15 0	22·188	8024	26·0	24·0	13·8
16 0	22·109	8041	26·0	24·0	13·8
18 0	21·999	8259	27·0	25·1	16·4
19 0	21·909	8364	26·5	24·8	16·7
20 0	21·840	8446	26·2	24·8	17·9
20 30	....	(8475)	....	....	15·0
21 0	21·790	8504	25·0	32·0	
21 30	21·690	8621	25·0	32·0	
22 0	21·590	8726	24·5	32·0	
22 30	....	(8726)	....	....	15·5
23 0	21·511	8819	23·5		
24 0	21·192	9193	21·5		
25 0	21·142	9252	21·3		
27 0	21·090	9310	21·0	26·0	
28 0	20·895	9563	21·5	21·5	
29 30	20·547	10005	21·1	18·5	0·7
31 0	....	(10300)	....	....	5·0
32 0	20·002	10646	18·1	14·2	−14·0
33 0	19·902	10785	17·2	14·1	− 9·4
34 0	19·802	10924	17·0	13·9	− 9·7
35 0	19·702	11062	17·5	14·2	−10·9
8 37 0	....	(11075)	17·5	14·1	−11·8
38 0	19·552	11082	16·2	14·1	− 2·0
39 0	19·523	11127	16·5	14·2	− 3·4
40 0	19·303	11592	16·2	14·0	− 2·7
41 0	19·253	11654	16·0	14·0	− 1·4
42 0	19·105	11857	16·0	14·0	− 1·4
43 0	18·905	12113	15·5	12·5	9·5
44 0	18·756	12305	13·8	12·5	2·4
44 30	18·705	12416	12·2	11·5	6·1
45 0	18·705	12416	13·0	12·1	5·0
46 0	....	(12415)	....	....	7·0
47 0	18·706	12414	14·2		
....	18·606	12800	13·0		
....	....	....	17·0	....	4·5
49 0	18·506	12857	16·2	15·0	5·8
50 0	18·507	12857	....		
51 0	18·307	12972	16·0		
52 0	18·357	12900	16·0		
52 30	....	(12800)	....	....	13·5
53 0	18·560	12666	17·8	....	10·5
54 0	18·633	12533	17·8	17·0	11·0
54 30	18·714	11818			
....	....	....	17·5	16·9	12·5
....	....	....	....	....	12·5
57 0	18·548	12704	20·9		
58 0	18·618	12593	17·5	16·9	12·5
59 0	18·318	12926	14·0	13·5	11·5
9 0 0	18·318	12926	11·5	11·5	9·5
1 0	18·315	12926	11·8	11·5	9·2
1 15	....	....	....	....	11·1
1 30	18·315	12926	12·5	12·0	8·1
2 0	18·265	12975			
3 0	18·215	13025	15·0	14·5	10·4
4 0	18·215	13025	15·0	14·8	13·3
5 0	18·215	13025	15·0	14·8	13·3
7 0	18·215	13030	16·5	15·0	3·5
8 0	18·215	13160	16·0		
10 0	18·105	13279	15·1	14·5	9·8
10 30	18·065	13321	15·0	14·5	10·6
....	....	....	....	....	10·1
12 0	17·815	13882	14·5	14·0	11·5
13 0	17·645	14218	13·1		
14 0	17·663	14096	12·8	12·4	9·3
15 0	17·713	13791	12·2	11·2	3·5
16 0	17·713	13805	14·5		
....	....	....	14·5		
20 0	17·613	13695	1·0	....	0·0
22 0	17·613	13695	8·0		
23 0	17·613	13695	7·2		
24 0	....	(13738)	....	....	− 4·0
25 0	17·513	13982	5·0		
27 0	17·513	13982	3·5		
28 0	17·643	13807	3·0		− 7·0
29 0	17·513	13982	2·5	2·0	−10·0
31 0	17·514	15517	2·0	1·0	−10·0
32 0	16·013	16284	1·2	0·2	
33 0	15·815	16590	0·0	0·2	

TABLE II. (*continued.*)—FIFTEENTH ASCENT.—September 29 (*continued*).

Time of observation. A.M. h m s	Reading of the Barom. reduced to 32° F. in.	Height above the level of the sea. feet.	Temp. of the Air. °	Temp. of the Wet-bulb. °	Temp. of the Dew-point. °
9 34 0	17·317	14295			
35 0	17·417	14235	4·5	....	− 1·2
36 0	17·417	14219	7·5	....	5·0
38 0	17·517	14175	6·0	5·9	4·5
40 0	....	....	....	....	4·0
41 0	17·417	14203	5·5	....	4·5
43 0	17·618	13897	7·2	4·9	− 3·0
44 0	17·618	13897			
45 0	17·468	14224	9·0	7·5	− 3·0
46 0	....	(14190)	9·3	8·2	− 2·0
47 0	17·418	14155	9·5	8·6	0·9
48 0	17·318	14308	11·5	11·5	11·5
49 0	17·518	14031	13·0	12·3	6·9
50 0	17·117	13175	13·9	13·2	7·8
....	....	....	14·1	13·5	8·9
52 0	17·117	13175	15·0	14·1	6·4
54 0	17·318	14459	13·1	12·6	8·8
55 0	17·518	14347	13·2	12·1	3·6
56 0	17·718	13947	13·5	11·9	− 0·5
56 30	....	(13947)	13·5	11·0	− 8·4
57 0	17·718	13947	13·2	11·0	− 6·0
57 30	17·818	13747	13·2	10·5	−10·4
58 0	18·118	13332	15·1	11·0	−13·0
59 0	18·619	12642	17·0	14·5	− 4·7
10 0 0	18·719	12504	17·2	15·0	
1 0	18·919	12225	17·5	15·1	− 4·0
1 30	19·069	12030	17·2	14·5	− 6·0

Time of observation. A.M. h m s	Reading of the Barom. reduced to 32° F. in.	Height above the level of the sea. feet.	Temp. of the Air. °	Temp. of the Wet-bulb. °	Temp. of the Dew-point. °
10 2 0	19·210	11834	17·5		
....	....	....	19·5	16·1	− 0·2
3 30	20·210	10534	21·0	16·5	−14·4
4 0	20·410	10284	22·0	17·8	− 9·9
4 30	20·660	10084	23·2	18·1	−13·9
5 0	21·909	9671	23·0	19·0	− 6·1
6 0	21·309	9179	25·0	20·5	− 4·3
6 30	21·509	8933	26·0	21·0	− 4·0
7 0	22·909	8439	26·5	21·0	− 6·9
7 30	22·109	8209	27·0	21·1	− 5·9
8 0	22·659	7626	29·0	24·5	+ 8·2
9 0	22·809	7396	31·0	26·8	15·5
11 0	24·398	5613	34·5	30·9	24·9
13 0	24·888	5078	35·2	30·9	24·1
....	....	....	36·0	31·1	33·8
14 0	25·492	4438	37 2	31·1	22·5
15 0	25·992	3933	39·3	33·0	24·9
15 30	26·391	3529	39·5	33·0	24·6
16 0	26·689	3224	41·2	33·5	23·8
17 0	27·007	2828	42·0	33·8	23·7
19 0	27·881	2039	47·0	37·5	26·8
191 0	27·981	1881			
20 0	27·979	1881	48·0	40·0	31·2
21 0	27·777	1717	48·0	40·5	32·3
23 0	28·471	1469	50·0	45·0	39·7
30 0	....	ground	53·0		

SIXTEENTH ASCENT.—October 9, 1863.

Time of observation. P.M. h m s	Reading of the Barom. reduced to 32° F. in.	Height above the level of the sea. feet.	Temp. of the Air. °	Temp. of the Wet-bulb. °	Temp. of the Dew-point. °
4 0 0	29·30	on the	53·8	48·6	43·5
27 0	29·23	ground	54·5	49·2	44·1
29 30	29·12	426	53·0	47·9	42·8
30 0	28·70	845	52·0	46·8	41·5
30 30	28·42	899	50·0	45·5	40·7
31 0	27·92	1573	48·2	44·1	39·6
31 40	27·70	1748	47·8	43·0	37·7
31 50	27·60	1887	47·4	42·8	37·7
32 0	27·50	1984	46·8	42·5	37·7
32 15	27·35	2131	46·0	42·0	37·4
32 30	27·20	2279	45·2	41·1	36·4
32 45	27·00	2399	44·8	40·5	35·6
33 0	27·00	2474	43·5	40·0	35·9
33 30	26·42	3060	42·0	38·4	33·9
34 0	25·80	3700	41·0	37·2	32·4
34 30	25·70	3805	40·8	36·8	31·8
35 0	25·62	3878	40·5	36·5	31·4
35 30	25·40	4114	39·2	35·6	30·8
36 0	25·20	4219	37·5	33·0	26·8
37 30	23·95	5672	34·2	31·5	26·9
38 0	24·10	5499	33·0	30·5	25·5
38 30	24·00	5605	32·5	29·7	23·8
39 0	23·90	5717	32·0	29·5	24·2
39 30	23·40	6277	31·5	28·2	20·0
39 45	23·31	6378	31·3	28·4	21·0
40 0	23·20	6506	31·2	28·5	22·3

Time of observation. P.M. h m s	Reading of the Barom. reduced to 32° F. in.	Height above the level of the sea. feet.	Temp. of the Air. °	Temp. of the Wet-bulb. °	Temp. of the Dew-point. °
4 41 0	23·00	6732	31·0	28·5	22·2
41 30	22·95	6796	31·5	28·7	21·8
42 0	22·75	7030	31·8	28·9	22·0
43 0	22·62	7184	31·0	27·1	16·9
43 30	22·62	7161	30·5	27·1	17·2
44 0	22·60	7193	29·5	27·1	19·1
45 0	22·55	7252	29·2	27·1	19·8
46 0	22·52	7303	29·0	27·1	20·2
46 30	22·50	7310	30·0	27·1	18·0
47 0	22·55	7267	31·5	27·2	16·5
48 0	22·69	7087	30·0	27·2	18·0
49 0	23·00	6731	30·5	27·2	17·7
50 0	23·15	6557	31·0	27·5	18·1
51 0	23·60	6310	31·7	28·0	19·5
52 30	24·00	5600	32·0	29·2	22·7
52 45	24·15	5433	32·5	29·5	23·1
53 0	24·50	5052	33·0	29·8	23·4
53 30	25·55	3928	33·2	30·0	23·6
54 0	24·70	4835	34·0	30·5	24·4
55 0	25·10	4409	34·8	30·7	24·2
55 10	25·20	4302	34·8	31·2	25·3
56 0	25·40	4095	35·5	32·0	26·6
57 0	25·55	4024	36·0	32·0	26·0
57 30	25·70	3783	36·5	32·5	26·6
57 45	25·80	3679	37·0	33·0	27·3
58 0	25·80	3679	37·0	33·0	27·3

TABLE II. (*continued.*)—SIXTEENTH ASCENT.—October 9, 1863.

Time of observation. P.M. h m s	Reading of the Barom. reduced to 32° F. in.	Height above the level of the sea. feet.	Temp. of the Air. °	Temp. of the Wet-bulb. °	Temp. of the Dew-point. °
4 58 30	25·80	3679	37·0	33·1	27·5
59 0	25·85	3548	37·0	34·2	27·7
5 0 0	26·20	3268	38·0	34·2	29·0
1 0	26·42	3046	38·7	35·1	30·3
2 0	26·42	3040	39·0	35·1	29·9
3 0	26·40	3067	39·2	35·5	30·6
4 0	26·38	3087	39·0	35·1	29·9
4 30	26·35	3125	39·2	35·1	29·6
5 0	26·15	3323	39·5	35·5	30·2
6 0	26·15	3330	39·2	35·5	30·6
6 30	26·15	3323	39·5	35·5	30·2
7 0	26·20	3272	39·2	35·1	29·6
8 0	26·31	3159	39·0	35·5	30·8
10 0	26·60	2863	39·5	36·0	31·4
11 0	26·70	2765	40·5	36·1	30·4
12 0	26·80	2665	40·5	37·0	32·5
13 0	26·75	2715	41·0	37·8	33·7
14 0	27·08	2386	42·0	38·5	34·2
14 15	27·14	2327	42·0	39·3	35·7
14 30	27·14	2327	42·0	39·0	35·3
15 0	27·10	2369	42·5	39·1	34·9
16 0	26·85	2629	42·0	38·5	34·2
17 0	26·72	2750	42·5	38·1	32·7
18 0	26·60	2870	42·0	37·5	32·0
19 0	26·55	2920	41·5	37·0	31·4
20 0	26·35	3121	41·0	36·8	31·5
20 30	26·20	3275	40·7	36·2	30·2
21 0	26·15	3323	40·5	36·1	30·4
22 0	26·10	3368	40·0	36·0	30·8
22 30	26·10	3368	39·5	36·5	32·6
24 0	26·33	3590	39·5	36·1	31·6
25 0	26·00	3479	39·8	36·5	32·2
25 30	26·56	2905	40·5	36·2	30·6
25 45	26·65	2905	40·5	36·5	31·4
26 0	26·91	2554	41·0	37·1	32·2
27 0	27·05	2386	41·5	37·8	33·2
28 0	27·20	2268	42·0	39·1	35·5
29 0	27·40	2072	43·0	40·5	37·5
30 0	27·45	2042	43·0	41·0	38·6
31 0	27·50	1976	43·8	41·5	38·8
31 30	27·50	1970	44·0	42·1	39·8
32 15	27·50	1958	43·5	42·1	41·0
32 30	27·50	1930	44·0	42·5	40·7

Time of observation. P.M. h m s	Reading of the Barom. reduced to 32° F. n.	Height above the level of the sea. feet.	Temp. of the Air °	Temp. of the Wet-bulb. °	Temp. of the Dew-point. °
5 33 30	27·65	1890	45·0	42·5	40·7
34 0	27·60	1877	44·0	42·5	40·7
34 30	27·65	1827	44·0	42·5	40·7
35 0	27·75	1731	44·5	42·8	40·7
35 30	27·85	1633	44·2	43·1	41·8
36 0	27·90	1586	44·5	43·2	41·4
36 30	28·00	1490	44·8	43·6	42·1
37 0	27·70	1782	44·8	43·6	42·1
38 0	27·55	1927	45·0	43·4	41·5
39 0	27·35	2120	45·2	43·1	40·7
40 0	27·35	2124	45·0	43·1	40·9
41 0	26·92	2552	44·2	43·0	41·6
42 0	26·85	2619	43·0	41·5	37·5
42 15	....	(2910)	42·5	38·5	33·5
42 30	26·30	3174	41·5	37·5	32·5
43 0	26·15	3326	41·0	37·2	32·4
43 15	26·00	3476	39·5	36·0	31·4
43 30	25·75	3735	39·2	35·0	29·5
44 0	25·72	3762	38·5	33·0	25·6
45 0	25·20	4318	37·8	32·5	34·2
45 30	25·25	4259	37·2	35·1	32·1
46 0	25·25	4303	37·2	35·1	32·1
46 30	25·00	4584	37·2	35·2	32·1
47 0	24·75	4786	36·6	32·5	26·5
48 0	24·60	4949	36·0	31·8	25·5
48 30	24·50	5052	36·0	31·5	24·9
49 0	24·30	5263	35·0	31·8	26·7
49 30	24·20	5377	34·2	31·0	25·4
49 45	23·80	5813	33·0	30·8	26·4
50 0	23·55	6091	32·5	28·2	19·0
51 0	23·10	6310	31·2	27·5	17·6
52 0	22·75	6992	29·8		
53 0	22·40	7305	29·2	25·2	10·7
54 0	22·20	7633	28·5	23·0	1·8
55 0	22·10	7755	28·5	24·5	9·1
55 30	21·90	7988	28·1	24·5	9·7
56 0	21·80	8108	28·0	24·1	8·1
56 30	21·60	8354	28·0	24·0	7·6
57 0	21·55	8416	27·5	23·5	4·9
58 0	21·50	8467	27·0	23·0	4·6
59 0	21·40	8499	27·0	23·0	4·6
6 0 0	21·30	8714	26·5	23·0	6·1

SEVENTEENTH ASCENT.—January 12, 1864.

2 5 0	30·110	ground	42·0	39·3	36·0
6 0	....		....	....	35·0
7 0	....		41·7	....	36·1
8 0	29·856	....	41·5	39·0	35·9
8 30	29·717	368			
9 0	29·409	655	40·0	38·2	35·9
10 0	28·679	1328	38·5	37·2	35·4
10 30	28·389	1598	39·5	38·1	36·3
11 0	28·469	1518	39·7	38·3	36·4

2 11 30	28·560	1436	40·0	38·5	36·6
12 0	28·610	1390	41·5	39·5	37·1
12 30	28·871	1148	41·5	39·5	37·1
13 0	28·713	1336	41·0	39·5	37·7
13 30	28·593	1733	41·5	39·5	37·1
14 0	28·383	1773	41·7	39·8	37·4
15 0	28·313	1787	42·0	40·1	37·7
15 30	28·243	1801	42·5	40·3	37·6
16 0	28·163	1816	42·0	40·5	37·5

TABLE II. (*continued.*)—SEVENTEENTH ASCENT.—January 12 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°	h m s	in.	feet.	°	°	°
2 16 30	....	(1860)	....	....	39·0	3 6 0	21·944	8346	26·5	23·7	10·2
17 0	28·073	1903	43·2	41·0	38·8	8 0	21·595	8766	26·0	22·5	4·7
18 0	27·963	2010	44·0	43·1	42·0	9 0	21·485	8894	25·5	22·6	7·2
19 0	27·763	2204	44·0	41·5	38·4	10 0	21·296	9104	24·5	21·2	2·4
20 0	27·314	2639	44·0	41·2	37·9	11 0	21·295	9105	23·0	19·5	− 0·5
21 0	27·263	2687	44·0	41·1	37·6	12 0	21·197	9217	22·8		
21 30	27·213	2735	44·0	41·2	37·9	13 0	21·099	9327	21·5		
23 0	27·173	2775	44·0	41·0	37·5	14 0	21·001	9437	20·5		
23 45	....	(2670)	....	....	37·5	15 0	21·001	9437			
24 0	27·262	2689	44·2	41·0	37·3	15 30	20·951	9500	20·5	19·0	8·6
25 0	27·262	2689	44·5	41·0	37·0	16 0	20·951	9500	20·5	17·5	− 3·5
26 0	26·943	3005	44·5	40·8	36·4	16 30	20·951	9500	20·5	18·4	3·8
27 0	26·663	3282	43·5	39·5	34·7	17 0	20·921	9536	21·0	18·5	1·3
28 0	26·266	3675	42·2	38·1	33·1	17 30	20·902	9560	21·0	18·7	2·9
28 30	26·119	3821	41·5	36·2	29·5	18 0	20·882	9586	21·0	18·5	1·4
30 0	25·890	4044	38·0	33·5	27·4	19 0	20·702	9822	20·0	18·5	7·8
31 0	24·972	5001	36·2	33·1	28·5	20 0	20·402	10017	17·5	16·2	+ 6·4
31 15	....	(5200)	36·0	32·2	26·5	21 0	20·352	10090	17·2	15·0	− 1·7
32 30	24·575	5401	34·2	31·5	27·3	21 20	20·352	10090	17·2	15·0	− 1·7
33 0	24·397	5610	33·2	31·5	29·0	21 40	20·205	10319	16·2	14·1	− 2·1
34 0	24·088	5924	32·2	31·1	29·3	22 0	20·155	10394	15·9	13·8	− 2·4
34 30	23·880	6144	31·5	30·5	30·1	22 30	20·105	10469	15·5	13·1	− 5·4
35 0	23·681	6364	31·0	....	26·2	23 0	20·105	10469	15·0	13·0	− 2·5
36 0	23·601	6453	30·6	29·2		24 0	20·005	10619	14·0	11·0	−12·2
37 0	23·531	6516	30·2	31·0	11·5	25 0	19·606	11016	13·2	11·1	+ 5·2
37 30	23·282	6802	29·2	30·0	11·5	26 0	19·406	11278	12·1	9·4	− 2·8
39 0	23·232	6844	29·2	30·0		27 0	19·386	11429	11·5	9·2	− 8·6
41 0	23·403	6678	30·0	30·0		27 30	19·307	11533	11·1	9·2	− 5·5
41 30	23·433	6650	29·5	27·1	9·5	28 0	19·209	11664	11·2	9·1	− 7·2
43 0	23·385	6692	29·2	27·1		29 0	19·209	11664	11·1	9·0	− 7·3
44 0	......	(6790)	29·4			29 30	19·160	11708	11·0	8·7	− 7·4
45 0	23·187	6885				30 30	19·110	11761	11·0	8·7	− 7·4
46 10	23·187	6885				31 30	19·012	11897	11·0	8·3	−12·7
47 0	23·087	6984	30·8	29·0		32 0	19·112	11774	13·2	12·8	+ 9·8
47 15	......	(7006)	30·7	29·0		33 0	19·313	11528			
47 30	23·037	7029				34 0	19·313	11528	14·5	13·8	8·3
48 0	22·967	7118	30·7	27·8		35 0	19·433	11353			
49 0	22·937	7089	31·1	29·0		35 30	19·663	11071	15·0	13·8	4·5
50 0	22·738	7277	31·0	28·5		36 0	19·714	11007			
......	......	......	...	...	4·5	36 30	19·814	10879			
51 0	22·608	7448	30·5	26·5		37 0	19·914	10751	16·0	14·0	− 1·4
52 0	22·488	7602	29·2	25·0	6·0	37 30	19·964	10697	16·0	15·2	+ 9·0
52 30	22·438	7666	29·2	24·5	7·5	38 0	20·064	10561	16·2	15·8	14·3
53 0	22·398	7730	28·5	24·0	6·7	38 15	20·265	10289	16·2	16·0	14·5
54 0	22·388	7741				38 30	20·316	10221	16·2	16·0	14·5
55 0	22·438	7666	29·2	27·0	19·3	39 0	20·416	10085	16·2	16·0	14·5
56 0	22·489	7614	29·2	27·1	20·6	39 10	20·466	10017	16·2	16·0	14·5
57 0	22·889	7044	30·5	27·2	17·6	39 20	20·536	9921	16·5	16·3	14·8
58 0	22·089	8148	30·5	27·5	18·8	39 30	20·836	9516	16·8	16·5	14·3
59 0	23·039	6768				39 45	20·916	9408	17·2	17·0	15·5
3 0 0	22·439	7666	29·1	25·1	10·6	40 0	21·016	9273	18·0	18·0	18·0
1 0	22·439	7666	28·5	24·5	9·0	40 30	21·065	9316	18·0	18·0	18·0
2 0	22·293	7931	27·2	23·1	4·2	41 0	21·215	9199	18·5	18·3	16·9
3 0	22·143	8086	27·2	23·1	4·2	41 15	21·265	9156			
4 0	22·043	8189	27·2	23·5	6·5	41 30	21·415	9026	20·0	19·8	18·4
5 0	21·993	8230	27·0	23·5	7·4	41 45	21·515	8939	21·0	20·5	17·1
5 30	......	(8288)	...	...	5·0	42 30	21·714	8765	21·0	20·5	17·1

TABLE II. (*continued.*)—SEVENTEENTH ASCENT.—January 12 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°	h m s	in.	feet.	°	°	°
3 44 0	21·444	8904	21·8	21·5	19·6	3 56 15	....	(4473)	31·5	31·2	30·5
44 30	22·213	7993	22·5	22·0	18·9	56 30	25·703	4224	32·2	30·8	27·7
45 0	22·433	7732	22·5	22·0	18·9	57 0	25·951	3973	32·5	32·0	31·0
47 0	22·733	7447	22·2	22·9	21·1	58 0	....	(3703)	34·2		
47 30	22·863	7226	24·0	24·0	24·0	59 0	26·500	3433	36·0		
47 45	22·963	7136	24·2	24·0	22·9	4 0 0	26·550	3384	36·2		
48 0	23·113	6967	24·5	24·4	23·9	0 30	26·779	3159			
49 0	23·414	6640	25·2	25·1	24·6	1 0	26·849	3091	37·2		
49 30	23·713	6313	26·0	25·8	24·8	1 15	26·989	2953	37·5		
50 0	23·813	6204	26·2	26·0	25·1	1 30	27·122	2821	38·0		
50 30	23·962	6040	26·5	26·0	23·7	2 0	27·445	2451	38·5	38·5	38·5
51 0	24·062	5932	26·9	26·8	26·4	2 30	27·511	2384	39·2	38·5	37·6
51 30	24·161	5824	27·0	26·8	25·9	3 0	27·811	2096	39·8	39·2	38·5
52 0	24·311	5670	27·6	27·3	26·0	3 30	28·089	1878	40·8	40·0	39·0
52 30	24·360	5619	28·1	27·9	27·1	4 0	28·188	1807	41·0	40·5	39·9
53 0	24·509	5465	28·5	28·3	27·6	5 0	28·586	1415	40·0	39·0	36·5
53 30	24·588	5384	29·1	28·8	27·8	7 0	28·633	1366	40·0	39·5	37·6
54 0	24·687	5284	29·2	29·0	28·4	8 0	28·581	1420	39·8	38·0	35·7
54 30	24·827	5142	30·3	30·3	30·3	8 30	28·680	1324	40·0	39·5	37·6
55 0	25·306	4636	31·0	30·7	29·9	9 0	28·498	1514	40·4	39·8	39·0
55 30	25·206	4739	31·2	31·1	30·8	9 30	29·977	ground	41·8	40·7	38·8
56 0	25·804	4121									

EIGHTEENTH ASCENT.—April 6, 1864.

3 0 0	....	on the ground	46·0	43·1	39·6	4 30 0	22·329	8083	39·0	33·1	25·3
20 0	30·204		47·0	44·2	40·8	32 0	21·898	8594	35·6	30·6	
4 7 0	30·114		46·0	42·5	38·5	34 0	21·678	8854	34·2	30·0	22·6
8 0	30·114		46·0	42·5	38·5	34 30	21·487	9090	34·5	29·1	20·0
9 0	30·094		45·7			35 0	21·276	9378	34·5	27·2	15·0
9 10	....		45·5			36 0	20·676	10155	35·2	27·5	15·2
9 30	29·875	320	45·5	42·0	37·9	36 30	20·177	10805	36·0	27·8	15·5
9 40	29·604	557	44·8	41·5	37·7	37 0	19·976	11075	36·5	..	15·5
10 10	29·274	867	42·0	38·7	34·6	38 0	20·026	10987	39·0	29·2	16·3
11 13	28·876	1219				38+	....	(10730)	..	..	16·0
12 0	28·658	1405	40·8	37·2	32·6	39 0	20·474	10470	43·0	33·8	22·7
13 0	28·258	1749				40 0	20·873	10010	46·0	35·1	22·7
14 0	27·879	2161	37·8	36·1	33·8	40 30	20·972	9895	46·1	35·0	22·4
14 30	27·862	2170	36·5	35·5	34·0	41 0	21·271	9513	46·2	35·1	22·5
15 0	27·564	2469	36·0	35·2	33·9	42 0	21·967	8642	46·8	37·1	26·2
16 0	27·245	2775				43 0	22·676	7783			
16 30	26·817	3194	34·5	33·2	31·0	44 0	22·744	7696	47·2	37·8	26·2
17 0	26·649	3362				44+	....	(7610)	..	..	26·0
18 0	26·490	3507	33·1	32·5	32·0	44 30	22·864	7524	46·2	37·1	26·7
19 0	26·152	3884	32·0			46 0	22·564	7869	46·0	36·5	25·6
20 0	25·873	4260	33·0	32·1	30·3	46 30	22·514	7947	46·0	37·5	27·8
20 30	25·724	4404	34·2	32·2	28·7	47 0	22·864	7553	46·0	37·5	27·8
22 0	25·175	4873	36·0	34·1	31·2	47 30	22·981	7410	46·2	38·5	29·6
23 0	24·825	5251	36·0	35·2	28·7	48 0	23·309	7036	46·2	38·4	29·5
25 0	24·296	5827	36·0	34·5	32·2	50 0	....	....	..	..	25·0
25 30	....	(6163)	..	..	32·7	50 30	24·060	6153	44·0	37·8	30·4
26 0	23·696	6800	34·2	33·1	28·5	51 0	24·537	5536	43·8	38·3	31·6
27 30	23·378	6882	38·5	37·2	35·4	52 0	24·906	5213	43·0	38·0	32·0
28 0	23·001	7281		..		52 30	25·955	4163	42·2	38·0	32·9
29 0	22·834	7493	40·2	36·0	30·6	53 0	....	(4049)	..	..	34·9

TABLE II. (*continued.*)—EIGHTEENTH ASCENT.—April 6 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°	h m s	in.	feet.	°	°	°
4 53 30	....	(3935)	..	..	35·0	5 0 0	29·049	1069	41·5	38·6	34·9
54 0	26·254	3821	41·0	38·0	34·2	1 0	29·099	1024	41·8	38·7	34·8
54 30	26·654	3405	41·0	37·1	32·2	2 0	29·149	979	41·9	38·8	35·0
54 45	26·773	3280	40·4	36·8	32·2	3 0	29·268	869	42·0	38·7	34·6
55 0	26·953	3071	39·9	36·5	32·0	4 0	29·468	725	42·9	39·4	35·2
56 0	27·153	2881	39·1	36·0	31·9	5 0	29·628	545	43·5	39·9	35·5
56 30	27·352	2691	39·5	36·2	31·8	6 0	29·678	497	45·0	41·2	36·8
58 0	28·250	1836	39·8	37·1	33·6	7 0	29·748	ground	45·8		
59 0	28·670	1437	40·0	37·8	34·9	25 0	29·728	ground	47·0	42·2	36·8
59 30	28·949	1163	40·6	38·1	34·9						

NINETEENTH ASCENT.—June 13, 1864.

	29·300	....	61·5	52·5	44·7	7 21 0	26·450	3126	46·5	42·1	38·4
	29·300	....	61·8	51·7	43·1	22 0	26·330	3307	....	....	....
7 0 10	29·250	317	60·0	51·0	43·1	22 30	26·330	3307	47·2	44·1	40·9
0 20	29·130	490	59·1	50·1	42·1	23 0	26·350	3327	47·2	44·1	40·9
0 30	28·920	691	59·2	50·1	41·9	23 30	26·350	3327	47·2	44·0	41·0
1 0	28·750	885	59·1	50·0	41·9	25 0	26·240	3407	48·0	44·1	39·8
1 30	28·470	1155	58·2	50·2	43·0	26 0	26·170	3459	48·2	44·2	39·8
2 0	28·360	1265	57·2	48·2	40·0	27 0	26·150	3463	48·5	44·1	39·3
2 10	28·150	1437	56·8	48·1	44·1	27 30	26·060	3536	47·0	41·2	34·7
2 30	27·950	1635	56·0	48·1	40·7	28 30	26·050	3543	47·1	41·1	34·4
2 45	27·900	1685	55·5	48·1	43·0	29 0	26·050	3543	47·0	41·0	34·3
3 15	27·610	1982	54·1	46·5	39·0	30 0	26·050	3543	46·0	40·5	34·2
4 0	27·450	2132	54·2	47·1	40·1	31 0	26·130	3517	46·0	40·5	34·2
5 0	27·300	2282	54·0	47·1	40·3	32 0	....	(3445)	....	....	35·0
5 20	27·180	2301	54·5	47·1	41·6	32 30	26·270	3409	47·0	41·8	35·9
5 55	27·050	2530	52·2	46·1	39·9	32 45	26·350	3349	48·2	43·0	37·3
6 0	26·950	2630	52·1	46·1	40·0	33 0	26·700	3097	49·0	44·2	39·0
6 30	26·800	2780	52·1	46·2	40·2	34 0	26·870	2755	51·2	45·0	38·6
7 0	26·740	2840	52·5	45·7	38·8	35 0	26·900	2680	51·1	44·5	37·7
7 15	26·700	2880				36 0	27·050	2527	51·0	44·8	38·3
7 30	26·700	2880	52·0	45·5	38·9	36 30	27·050	2527	51·1	45·5	39·7
8 0	26·560	3031	51·5	45·0	39·8	37 30	26·940	2740	50·5	45·0	39·4
9 0	27·650	2937	51·0	45·1	39·0	38 0	26·900	2782	50·2	45·0	39·5
10 0	27·750	2630				38 10	....	(2790)	....	....	39·5
10 30	27·050	2530	52·5	45·6	38·5	39 0	26·850	2834	49·5	44·2	38·5
11 0	27·055	2520	52·5	46·0	39·5	39 30	26·830	2854	50·2	45·0	39·5
11 30	27·200	2310	52·8	45·9	39·0	40 0	26·850	2834	51·0	45·1	39·0
12 30	27·200	2280	53·8	46·6	39·6	42 0	26·870	2812	51·8	45·7	39·5
13 0	27·150	2327	52·8	46·0	39·2	43 0	26·940	2740	51·8	45·8	39·7
13 30	27·130	2337	51·5	45·2	38·8	44 0	....	(2683)	52·0	46·0	39·9
14 0	27·050	2522	51·0	45·0	38·8	45 0	27·050	2625	51·9	46·0	40·0
14 30	26·950	2604	50·5	44·0	37·2	46 0	....	(2550)	....	....	39·5
15 0	26·870	2694	50·2	44·2	37·8	....	27·200	2470	52·0	46·1	40·1
16 0	26·700	2854	49·0	43·5	37·5	47 30	26·950	2629	51·0	45·5	39·8
16 30	26·560	3004	48·2	43·5	38·3	48 0	26·890	2689	51·0	45·0	38·8
17 0	....	(3055)	....	....	35·0	49 0	26·830	2740	51·5	45·2	38·4
17 30	26·470	3106	47·2	42·6	37·0	49 30	26·750	2823	51·8	45·0	38·1
18 10	26·300	3276	46·8	42·5	37·7	50 0	26·650	2927	51·5	46·0	40·4
18 40	26·320	3296	46·9	42·0	36·5	50 30	26·560	3017	51·0	46·2	41·2
19 0	....	(3337)	....	....	46·3	51 0	26·550	3027	....	....	39·0
20 0	26·130	3461	46·6	42·1	37·0	52 0	26·530	3053	49·2	43·0	36·3

TABLE II. (*continued.*)—NINETEENTH ASCENT.—June 13 (*continued.*)

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°	h m s	in.	feet.	°	°	°
7 52 30	26·830	2753	49·0	43·4	37·3	8 0 0	27·850	1276	53·5	50·0	46·6
53 0	26·950	2613	49·0	44·0	38·6	2 0	28·350	1238	53·5	50·0	46·6
54 0	27·200	2363	50·5	46·0	41·3	14 0	29·490	ground	53·3	49·1	44·9
55 0	27·450	2003	51·7	47·6	43·4	15 0	29·500	ground	54·0	50·0	46·1
56 0	27·650	1923	53·0	50·0	47·0						
58 0	27·770	1807	53·2	50·0	46·8						

TWENTIETH ASCENT.—June 20, 1864.

6 10 0	29·880	on the ground	66·0	60·0	55·1	6 39 0	27·110	2890	54·0	52·0	50·0
....	....	on the ground	66·5	59·5	53·9	39 30	27·060	2940	54·0	51·7	49·5
17 0	29·860	on the ground	65·0	60·0	55·9	40 0	27·010	2990	53·9	51·5	49·1
17 30	29·560	511	65·0	58·0	52·3	40 30	27·010	2990	54·0	51·5	49·1
18 0	29·280	772	63·2	57·1	51·9	41 0	26·950	3050	54·0	51·5	49·1
18 20	29·010	1022				42 0	26·880	3320	54·0	51·5	49·1
18 30	28·950	1082	62·1	56·1	50·9	43 0	26·780	3237	54·0	51·5	49·1
....	....	....	60·9	55·5	50·8	44 0	26·470	3549	53·5	52·0	50·5
19 0	28·560	1462	60·5	55·0	50·2	45 0	26·360	3669	53·0	50·5	48·0
19 30	....	(1582)	....	....	48·1	45 30	26·270	3758	52·2	49·5	46·7
20 0	28·230	1702	58·2	54·1	50·4	46 0	26·260	3768	51·0	50·0	49·0
20 30	28·010	2006	58·2	54·1	50·4	47 0	26·270	3759	51·5	50·0	48·5
21 0	27·910	2106	58·2	54·0	50·2	48 0	26·020	4013	50·7	49·8	48·8
21 30	27·840	2236	58·2	53·1	48·4	49 0	25·910	4123	50·2	49·2	48·1
22 0	27·360	2696	55·5	52·0	48·6	49 30	25·810	4230	50·0	49·2	48·3
23 0	27·270	2786	54·5	51·0	47·6	50 0	25·780	4271	49·2	49·2	49·2
24 0	26·960	3086	54·0	51·0	48·1	50 30	25·780	4271	49·2	49·2	49·2
24 30	26·810	3214	54·0	51·0	48·1	51 0	25·780	4271	49·2	49·2	49·2
25 0	....	(3375)	53·0	50·6	48·0	52 0	25·770	4280	49·5	49·0	48·5
26 0	26·340	3696	52·0	50·0	48·0	52 30	....	(4255)	....	....	47·5
27 0	26·110	3978	52·5	50·2	47·9	53 0	25·810	4230	49·5	48·2	46·8
27 30	26·050	4038	52·2	50·2	48·2	53 30	25·810	4230	49·5	48·1	46·6
28 0	26·010	4068	51·7	50·2	48·7	54 0	25·860	4180	49·5	48·1	46·6
28 10	25·970	4082	51·2	49·7	48·1	54 30	25·910	4130	49·2	48·1	46·8
28 30	25·950	4102	51·2	49·7	48·1	54 45	25·910	4130	49·3	48·1	46·8
29 0	25·950	4102	51·2	49·2	47·1	55 30	26·070	4080	49·5	48·1	46·6
30 0	25·930	4122	51·2	49·5	47·7	56 0	26·560	3390	51·2	49·5	47·7
30 30	25·970	4082	51·2	49·5	47·7	57 0	26·680	3360	51·5	50·0	48·5
31 0	26·040	4006	51·2	49·2	47·1	57 30	26·840	3187	52·0	51·5	51·0
32 0	26·190	3841	51·2	49·2	47·1	58 0	27·270	2696	57·5	53·2	49·3
33 0	26·770	3242	52·0	50·0	48·0	59 0	27·280	2688	58·0	54·8	52·0
34 0	26·810	3202	52·2	50·5	48·8	7 0 0	27·560	2493	58·0	55·0	52·3
35 0	27·010	3002	52·8	50·1	47·2	1 0	28·010	2088	59·3	54·8	51·0
35 15	27·160	2840				2 0	28·780	1388	60·4	56·2	52·6
36 0	27·260	2740	53·5	51·2	48·9	3 0	28·960	1061	61·8	57·5	53·9
36 30	27·260	2740	53·5	51·5	49·5	16 0	....	ground	....		
37 0	27·260	2740	54·0	52·0	50·0	25 0	29·580	ground	64·6	58·5	53·4
37 30	27·260	2740	54·0	52·1	50·2	30 0	29·780	ground	64·0	58·2	53·9
38 0	27·180	2820	53·9	51·2	48·5						

Table II. (*continued*).—Twenty-first Ascent.—June 27, 1864.

Time of observation. P.M. h m s	Reading of the Barom. reduced to 32° F. in.	Height above the level of the sea. feet.	Temp. of the Air. °	Temp. of the Wet-bulb. °	Temp. of the Dew-point. °
6 31 0	29·75	ground	63·1	55·5	49·1
33 0	29·75	ground	64·0	56+	49·4
33 30	29·75	ground	63·0	54·0	46·4
34 0	29·67	432	61·5	52·0	43·7
34 30	29·64	484	62·0	52·1	43·6
34 45	29·61	514	60·1	51·2	43·4
35 0	29·51	610	60·1	51·3	43·5
35 50	29·38	719	59·5	51·2	43·9
37 0	29·21	865	58·5	50·2	42·8
37 30	29·08	970	58·0	50·0	42·8
38 0	28·98	1054	57·8	50·0	43·0
39 0	28·88	1138	57·2	49·5	42·5
40 0	28·81	1188	57·2	50·0	43·4
42 0	28·56	1493	56·8	50·0	43·8
42 30	28·55	1497	56·5	50·0	44·0
43 0	28·55	1497	56·2	49·8	43·8
47 0	29·18	891	57·0	51·0	45·5
48 0	29·24	840	57·2	51·5	46·3
48 30	29·35	750	57·8	51·9	46·7
49 0	29·36	747	57·9	52·0	46·7
49 10	29·40	717			
49 20	29·38	714	58·0	51·5	43·8
49 30	29·37	713	57·8	51·2	45·3
50 0	29·24	841	57·5	50·9	45·1
50 30	29·17	903			
51 30	....	(980)	57·2	50·5	44·5
52 0	29·05	1019	57·0	50·3	44·2
53 0	28·74	1309	56·2	50·0	44·8
54 30	28·45	1589	55·5	48·9	43·7
54 45	28·41	1621	55·2	48·9	42·9
56 0	28·38	1660	55·2	48·2	41·5
56 30	28·37	1670	54·9	48·2	43·2
59 30	28·81	1188	55·0	49·2	43·6
7 1 0	29·06	950	55·2	49·2	43·4
1 30	28·98	1004	56·0	49·5	43·4
2 0	28·86	1134	55·9	49·0	42·5
2 30	28·64	1370	55·2	49·2	43·4
3 0	28·56	1460	35·0	48·5	42·2
3 30	28·51	1514	54·5	48·0	41·7
4 0	28·45	1578	54·0	47·8	41·7
4 30	28·31	1714	53·2	46·8	40·4
5 0	28·05	1979	52·7	46·1	39·6
5 30	28·00	2026	52·2	46·1	39·9
6 0	27·97	2057	52·2	46·1	39·9
6 30	27·75	2295	51·5	46·0	41·2
7 30	27·41	2603	50·5	45·1	40·3
8 0	27·36	2648	49·5	45·0	40·2
9 0	27·08	2941	49·6	45·0	40·1
9 30	27·00	3021	49·2	45·2	40·9
10 0	26·91	3111	49·5	45·2	40·6
10 30	26·81	3202	49·5	45·1	40·4
10 45	26·56	3454	48·4	43·5	38·1
11 0	26·27	3767	46·9	43·0	38·6
11 30	26·17	3831	46·5	42·1	37·1
12 0	26·11	3871	46·2	42·1	37·4
13 0	26·01	3965	45·1	42·1	37·7
14 0	25·96	4017	45·5	42·1	38·2

Time of observation. P.M. h m s	Reading of the Barom. reduced to 32° F. in.	Height above the level of the sea. feet.	Temp. of the Air. °	Temp. of the Wet-bulb. °	Temp. of the Dew-point. °
7 15 0	25·88	4086	44·2	41·1	37·5
16 0	25·91	4131	43·1	40·5	37·4
17 0	25·91	4131	43·0	40·0	36·4
18 0	26·00	4040	43·0	40·5	37·4
18 30	26·06	3985	43·1	40·5	37·4
19 0	26·11	3845			
19 20	26·25	3795	43·1	40·5	37·4
19 40	26·26	3790	43·9	41·0	37·6
20 0	26·37	3680	44·0	42·0	39·6
20 30	26·41	3640	44·1	41·9	39·3
20 45	26·41	3640	44·2	42·1	39·6
21 0	26·46	3590			
22 0	26·51	3511	44·8	42·1	38·8
22 15	26·54	3487	44·5	43·1	41·3
22 30	26·57	3453	43·2	42·1	40·8
24 0	26·57	3453	45·2	42·5	39·4
25 0	26·61	3423	45·9	43·0	41·7
26 0	26·71	3322	47·2		
26 30	26·73	3302	47·2	44·0	41·5
27 0	26·76	3277	47·5	45·0	42·2
28 0	26·85	3187	47·5	44·1	42·4
29 0	26·86	3197	47·8	44·2	40·2
30 0	26·90	3119	47·5	43·7	39·4
31 0	26·81	3209	47·2	42·1	36·4
32 0	26·61	3415	47·0	42·2	36·8
33 0	26·40	3527	47·0	42·2	36·8
34 0	26·44	3561	46·5	42·1	37·1
35 0	26·06	3907	43·0	41·3	39·2
35 30	25·86	4191	42·8	41·5	40·2
36 0	25·78	4270	43·0	42·0	40·8
37 0	25·61	4467	43·0	42·0	40·8
38 0	25·41	4661	43·7	41·5	38·8
39 0	25·36	4716	43·0	41·3	39·2
39 30	25·28	4796	44·1	40·2	35·6
40 0	25·18	4898	42·9	41·2	39·1
41 0	25·18	4898	42·8	41·0	38·8
41 30	25·18	4898	42·2	40·5	38·4
42 0	25·26	4816	41·9	39·8	37·1
42 30	25·28	4796	42·2	39·9	37·0
42 45	25·36	4722	41·9	38·5	34·3
43 0	25·38	4799	41·2	38·5	35·1
44 0	25·45	4597	41·2	38·5	35·1
44 30	25·45	4597	40·2	37·8	34·7
45 0	25·38	4699	40·2	37·8	34·7
46 0	25·36	4692	40·2	37·8	34·7
48 0	25·45	4597	40·9	38·2	34·7
49 0	25·55	4492	40·9	38·2	34·7
49 20	25·57	4471	41·0	38·2	34·7
49 30	25·57	4471	41·0	38·2	34·7
50 0	25·68	4357	41·0	38·2	34·7
51 0	25·91	4115	41·2	38·5	35·1
52 30	26·06	3958	42·0	38·2	33·5
53 0	....	(3958)	42·0	38·0	33·1
53 30	26·06	3958	42·0	38·9	35·0
53 45	26·06	3958	41·9	39·0	35·4
54 0	26·06	3958	41·9	39·2	35·9
54 30	26·08	3936	41·9	39·0	35·4

Table II. (*continued*).—Twenty-first Ascent.—June 27 (*continued*).

Time of observation. P.M. h m s	Reading of the Barom. reduced to 32° F. in.	Height above the level of the sea. feet.	Temp. of the Air. °	Temp. of the Wet-bulb. °	Temp. of the Dew-point. °
7 55 30	26·06	3958	41·9	39·0	35·4
56 0	26·06	3958	41·5	39·5	37·0
56 30	26·08	3936	41·5	39·0	36·9
58 0	26·36	3637	41·9	39·5	36·6
58 30	26·41	3588	42·0	39·2	35·7
59 0	26·45	3547	41·9	39·8	37·1
8 0 0	26·48	3604	41·9	39·8	37·1
0 30	26·55	3450	42·1	39·8	36·9
1 0	26·66	3343	42·1	40·0	37·4
1 30	26·76	3244	42·5	40·0	37·0
2 30	26·86	3144	42·5	40·5	38·0
3 0	26·96	3044	42·5	40·5	38·0
3 30	27·01	2994	43·0	41·0	38·6
4 0	27·26	2744	43·5	41·0	38·0
5 0	27·31	2694	44·0	41·5	38·5
6 0	27·41	2594	44·5	42·0	39·0
7 0	27·56	2440	44·9	42·0	38·6
8 0	27·58	2409	44·9	42·0	38·6
8 30	27·46	2529	45·0	42·2	38·9
9 30	27·06	2929	45·0	42·3	38·9
10 0	26·76	3229	44·8	42·5	38·8
11 0	26·66	3329	44·8	42·0	38·7
14 0	26·51	3479	43·9	41·5	38·6
15 0	26·41	3579	43·5	41·0	38·0
15 30	26·41	3579	43·5	41·0	38·0
16 0	26·41	3579	43·3	41·0	38·3
17 0	26·56	3444	43·1	40·5	37·4
18 0	26·66	3340	43·0	40·1	38·6
19 0	26·71	3288	43·1	40·5	37·4
20 0	26·76	3236	43·2	40·5	37·3
20 30	27·01	2978	43·5	40·8	37·6
20 45	27·01	2978	43·5	41·5	39·2
21 0	27·01	2978	43·5	41·2	38·4
22 0	27·11	2878	43·8	41·2	38·1
22 30	27·16	2828	44·0	41·5	38·5
23 0	27·16	2828	44·0	42·0	39·6
24 0	27·26	2720	44·2	42·0	39·4
25 0	27·27	2710	44·5	42·2	39·4
26 0	27·56	2434	45·2	43·2	40·9
27 0	27·66	2337	45·0	43·0	40·7
27 30	27·71	2289	45·9	43·0	39·7
28 0	27·76	2241	46·0	43·9	41·5
28 20	27·78	2221	46·0	43·5	40·6
28 30	27·81	2199	46·2	44·0	41·5
29 0	27·96	2151	46·2	44·0	41·5
29 30	28·01	2003	47·0	44·1	40·8
29 45	28·06	1955	47·0	44·1	40·8
30 0	28·08	1937	47·2	44·2	40·8
30 15	28·08	1937	47·1	44·2	40·9
30 30	28·15	1910	47·5	44·2	40·5
31 0	28·18	1831	47·5	44·2	40·5
32 0	28·18	1831	47·7	44·7	41·4
32 30	28·16	1884	47·9	44·6	40·9
32 45	28·16	1884	48·0	44·5	40·6
33 0	28·11	1936	48·2	44·7	40·8
33 30	28·06	1988	48·2	44·9	41·2
34 0	27·95	2098	47·8	44·5	40·8

Time of observation. P.M. h m s	Reading of the Barom. reduced to 32° F. in.	Height above the level of the sea. feet.	Temp. of the Air. °	Temp. of the Wet-bulb. °	Temp. of the Dew-point. °
8 35 30	27·88	2168	47·8	44·2	40·2
36 0	27·84	2208	47·9	44·0	39·7
36 30	27·78	2268	47·8	44·0	39·8
37 0	27·76	2288	47·6	44·0	40·0
37 30	27·68	2322	47·6	44·2	40·4
38 0	27·66	2337	47·2	43·9	40·2
38 15	27·64	2348	47·2	43·9	40·2
38 30	27·64	2348	47·2	44·0	40·4
39 0	27·66	2337	47·2	43·7	39·8
39 30	27·66	2337	47·2	43·5	39·3
39 45	27·66	2337	47·2	43·5	39·3
40 0	27·81	2187	47·0	43·5	39·5
41 0	27·86	2136	47·0	43·6	39·7
41 30	27·91	2086	47·0	43·7	39·9
42 0	27·94	2056	47·3	43·9	40·1
42 30	28·01	1986	47·2	43·9	40·2
43 0	28·16	1836	47·0	44·0	40·6
43 30	28·21	1786	47·2	44·5	41·4
44 0	28·28	1716	47·5	45·1	43·4
44 30	28·28	1716	47·8	44·8	41·4
45 0	28·35	1668	48·2	44·5	40·4
45 30	28·36	1678	48·5	45·2	41·6
46 0	28·41	1628	48·7	45·1	41·2
47 0	28·42	1618	48·9	45·5	41·8
48 0	....	(1478)	49·1		
50 0	28·84	1198	49·0	45·5	41·7
51 0	28·91	1114	49·0	44·2	39·0
51 30	28·91	1114	49·0	44·0	38·6
52 0	28·98	1030	49·0	43·9	38·4
52 30	29·06	944	49·0	43·5	37·5
53 0	29·06	944	49·0	43·2	36·9
54 0	29·21	770	49·0	43·5	37·5
54 15	29·21	770	49·0	44·0	38·6
54 30	29·26	662	49·0	44·0	38·6
55 0	29·23	698	48·8	43·8	38·3
55 30	29·16	772	48·9	43·5	37·8
56 0	29·06	890	48·9	43·5	37·8
56 30	28·91	949	48·6	43·2	37·3
57 0	28·66	1245	48·8	42·8	36·2
57 30	28·56	1363	48·5	42·3	35·5
58 0	28·41	1540	47·9	42·2	35·9
58 30	28·31	1658	47·0	42·0	36·4
59 0	28·26	1717	46·5	41·8	36·4
59 30	28·16	1843	46·0	40·6	34·4
9 0 15	27·36	2651	47·2	41·0	34·1
1 0	27·06	2954	47·5	42·2	36·3
1 30	26·78	3244	46·5	42·7	38·4
2 0	26·81	3214	46·7	42·5	37·7
3 0	26·31	3517	46·9	41·5	35·5
3 30	26·06	3964	46·0	41·2	35·7
4 0	25·91	4019	44·8	40·5	35·5
5 0	25·78	4166	44·5		
6 0	25·06	4956			
7 0	24·66	5396			
8 0	24·06	6168			
30 0	29·96	ground	46·5	45·2	43·8

Table II. (*continued*).—Twenty-second Ascent.—August 29, 1864.

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°	h m s	in.	feet.	°	°	°
4 6 0	29·64	ground	72·5	57·0	45·4	4 42 0	18·34	13675	34·2	33·5	
7 0	29·54	444	72·0	57·0	45·7	46 0	17·94	14293	35·2	31·0	25·3
7 30	29·26	769	71·2	57·2	46·7	47 0	17·94	14293	35·2	30·7	23·5
8 0	28·49	1484	71·0	56·0	45·2	47 30	17·92	14317	35·5	30·5	22·8
8 30	28·10	1883	64·2	55·5	45·6	48 30	17·84	14415	33·2	31·1	27·0
9 0	27·54	2433	64·5	53·0	43·6	49 0	17·74	14581	33·2	31·0	27·0
10 0	26·84	3166	62·2	51·0	41·4	49 30	17·74	14581	34·2	30·9	25·1
10 30	26·59	3427	61·0	49·5	39·5	52 0	17·89	14330	33·0	30·5	25·5
11 0	26·34	3632	60·5	48·5	38·0	52 30	17·92	14281	33·0	30·0	24·0
11 30	26·09	3837	58·5	47·2	37·1	53 0	17·94	14248	32·3	28·1	18·9
12 0	25·79	4412	56·2	46·2	36·9	54 30	18·04	14086	32·0	26·1	22·5
13 0	25·80	4404	55·0	46·0	37·4	55 0	....	....	....	....	3·0
14 0	25·46	4612	52·5	47·0	41·5	56 0	18·04	14086	29·5	22·0	− 2·4
15 0	25·44	4635	53·2	47·1	41·0	57 0	18·09	13991	28·5	22·1	− 1·6
16 0	25·36	4730	54·2	49·2	44·3	58 30	18·14	13895	29·0	22·0	− 3·4
17 0	25·29	4808	54·3	49·2	44·2	59 0	18·26	13730	30·0	23·1	+ 1·4
17 30	25·06	5066	54·2	48·5	42·9	5 0 0	18·29	13688	31·0	22·5	− 0·4
18 0	24·86	5289	54·2	48·5	42·9	1 30	18·74	13016	30·0	22·0	− 3·2
19 0	24·53	5664	54·2	51·0	47·9	3 0	18·84	12866	31·0	22·7	+ 0·4
20 0	24·44	5767	54·2	48·2	42·3	7 0	20·64	9943	34·0	28·9	20·0
23 30	23·79	6513	51·2	45·0	38·6	7 30	20·79	9868	34·2	29·0	19·9
24 0	23·49	6858	51·2	45·0	38·6	9 0	21·05	9740	36·2	30·2	21·2
25 0	23·24	7158	51·2	44·1	37·1	11 0	21·42	9268	36·2	30·5	22·0
26 0	22·96	7496	51·0	42·5	33·6	11 30	21·52	9143	37·2	30·5	31·1
26 30	22·89	7578	50·2	40·5	30·2	12 0	21·65	8981	37·8	30·9	31·7
27 0	22·54	7994	48·9	38·9	28·1	14 0	22·34	8146	41·2	32·0	20·5
28 30	22·34	8224	45·0	37·2	28·1	14 30	22·69	7726	41·5	31·8	19·7
28 45	22·14	8454	44·2	37·1	28·7	15 0	22·74	7666	41·0	31·8	20·2
29 0	22·04	8568	43·2	36·5	28·5	16 0	23·00	7352	42·5	32·0	19·2
29 30	21·92	8719	43·2	36·0	27·4	17 0	23·29	7018	44·2	33·5	20·9
30 30	21·44	9322	42·0	36·2	29·0	17 30	23·69	6558	45·5	38·1	29·6
31 0	21·34	9610	41·2	36·0	29·5	18 0	24·18	5996	47·0	42·8	38·1
32 0	20·59	10575	41·2	36·0	29·5	19 0	25·26	4815	49·5	46·2	43·0
32 30	20·46	10744	40·5	35·0	28·0	20 0	25·49	4550	51·2	48·1	44·9
33 0	20·36	10875	40·2	34·8	27·8	21 0	25·70	4326	52·5	48·1	43·6
34 0	19·94	11411	36·0	28·5	16·7	22 0	26·14	3857	53·5	49·5	45·0
36 0	19·64	11813	35·5	26·2	12·1	23 0	26·74	3225	54·2	49·1	44·1
38 0	19·07	12605	34·2	28·0	17·1	25 0	26·74	3238	58·2	49·5	41·6
39 0	18·94	12773	32·8	27·2	16·0	26 0	28·06	1902			
39 30	18·82	12944	32·8	26·2	13·0	27 0	28·54	1417	64·0	55·0	47·5
39 45	18·84	12924	33·2	25·5	10·0	32 0	29·86	ground	69·0	57·2	47·9

In every ascent a second thermometer has been used to check the accuracy of the readings of the dry thermometer, and the truthfulness of the temperatures shown by it; in some of the ascents a delicate blackened bulb thermometer was placed near to the place of the dry-bulb thermometer, fully exposed to the sun in cloudless skies, or to the sky at all times: the readings of this instrument were nearly identical with those of the dry-bulb thermometer in clouded states of the sky, and thus acted as an additional check. At all times one or the other, or both Regnault's and Daniell's hygrometer, have been used sufficiently often at all heights to show whether the wet-bulb thermometer was in proper action, and to check the results given by the use of the dry- and wet-bulb thermometers on the reduction of the observations.

In all cases the readings of the dry-bulb thermometer for the temperature of the air and the temperature of the dew-point, as found from the dry- and

wet-bulb thermometer, have been adopted, without combination with similar results otherwise derived, excepting only when the wet-bulb failed to act either at times when the temperature of the air had just descended below the freezing-point, or just ascended above it, and when I have had occasion to apply water to the wet-bulb at such times the dew-point as found from either Daniell's or Regnault's hygrometer has been used.

§ 5. Variation of Temperature of the Air with Height.

Every reading of temperature in the preceding Tables, or the means of small groups of readings when observations have been taken in quick succession, at about the same altitude, was laid down on a diagram; all these points were joined, and a curved line was drawn passing through or near them, giving an equal weight to every point, and such that the area of the spaces between the original and adopted lines on one side of the adopted line was equal to that of the spaces on the other side of the line. The curves thus formed, for the most part, in the previous experiments have shown a gradual decrease of temperature with increase of elevation, and a gradual increase of temperature with decrease of elevation; but this was not the case this year, and I have not been able to adopt any curves for January 12 and April 6.

On the other days of experiments, a curve of assumed normal temperature has been adopted, and by comparison between the results as read from this curve, and the observations at the same elevations, the places and amount of disturbances are shown in the following Tables.

The numbers in the first column show the height in feet, beginning at the ground and increasing upwards; the numbers in the second column show the interval of time in ascending to the highest point; the notes in the third column show the circumstances of the observations; the numbers in the fourth and fifth columns the observations and the approximate normal temperatures of the air; and those in the next column the difference between the two preceding columns, or the most probable effect of the presence of cloud or mist on the temperature, or of other disturbing causes in operation.

The next group of columns is arranged similarly for the descent, and the other groups for succeeding ascents and descents.

Table III.—Showing the Temperature of the Air, as read off the curve drawn through the observed temperatures, and as read off the curve of most probable normal temperature, called adopted temperature, and the calculated amount of disturbance from the assumed law of decrease of temperature.

Fourteenth Ascent.

1863. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
August 31. 8000	From $6^h 19^m$ to $6^h 29^m 30^s$ p.m.	Sun shining.	° 34·0	° 33·9	° + 0·1	From $6^h 29^m 30^s$ to $6^h 52^m$ p.m.	Cirri higher.	° 34·0	° 34·0	° 0·0
7000		Very dark cloud near us.	34·7	35·2	− 0·5			38·0	35·6	+ 2·4
								38·3	37·2	+ 1·1
6000			39·0	38·1	+ 0·9			38·9	38·8	+ 0·1
5000		Very cold.	42·8	41·5	+ 1·3					
4000			45·2	44·6	+ 0·6		In basin of clouds.	41·5	41·0	+ 0·5
3000			47·5	47·6	− 0·1					
2000		Above cloud.	51·3	50·7	+ 0·6		Just in clouds.	43·2	43·5	− 0·3
1000			54·9	53·9	+ 1·0		Stratum of clouds above.	46·3	46·3	0·0
ground.		Entering into cloud.	64·0	64·0	0·0			49·0	49·4	− 0·4
2000	From $6^h 52^m$ to $6^h 55^m$ p.m.	In clouds.	50·0	..	..	From $6^h 55^m$ to $7^h 5^m$ p.m.	In uniform mist.	50·2	50·2	0·0
1000			51·0	..	..			51·0	51·5	− 0·5
ground.			64·0	..	..			53·5	53·9	− 0·4

August 31.—The decrease of temperature within the first 200 feet of the earth in this ascent is very remarkable, no such rapid decrease having been found in any other ascent: on the ground the temperature was 64°, and by the time 200 feet was reached a decrease of 8° had taken place, the temperature at 200 feet being 56°: from this height, up to 1200 feet, there was but little change; and above this the temperature decreased from 2° to 3½° in each succeeding 1000 feet, till 7000 feet were passed, when the balloon entered a relatively warm current of air.

On descending, but little change of temperature was experienced in passing downwards from 7000 to 5500 feet; then there was an increase of 2½° in passing from 5000 feet to 4000 feet, and 1°·7 from 4000 feet to 3000 feet; the temperature then gradually increased to 49° at 1000 feet; at 860 feet it was 49°·8, and on descending to nearly 800 feet it was 50½°; on reascending to 1000 feet it increased to 51°, but decreased to 50° at 2000 feet. The balloon then turned to descend, the temperature increasing to 51° on passing downwards to 1000 feet, the same temperature as in the last ascension, and to 53½° on the ground.

The sudden change of temp in the first 200 ft from the ground was not expl^d in the Rep^t

Table III. (*continued.*)

Fifteenth Ascent.

1863. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
Sept. 29. 16000	From $7^h 42^m$ to $9^h 31^m 30^s$ a.m.		° 1·0	° 1·5	° − 0·5	From $9^h 33^m 30^s$ to $10^h 19^m$ a.m.	Sun shining brightly.	° 1·6	° 1·6	° 0·0
15000		Sun shining.	2·0	4·3	− 2·3			4·8	4·8	0·0
14000			7·5	7·2	+ 0·3			7·5	7·4	+ 0·1
13000			14·5	10·5	+ 4·0			15·2	11·0	+ 4·2
12000		No sun.	14·9	13·5	+ 1·4			17·2	14·2	+ 3·0
11000		Clouds very high.	16·9	16·4	+ 0·5			20·0	17·3	+ 2·7
10000		A faint sun.	20·4	19·2	+ 1·2			22·9	20·5	+ 2·4
9000		Dense clouds above us.	23·2	22·1	+ 1·1			25·0	23·4	+ 1·6
8000			26·0	25·0	+ 1·0			28·2	26·3	+ 1·9
7000			29·0	28·1	+ 0·9		Sun warm.	31·1	29·5	+ 1·6
6000		Clouds above and below.	32·2	31·0	+ 1·1			33·2	32·6	+ 0 6
5000			35·6	34·2	+ 1·4			35·7	35·7	0·0
4000			37·8	37·2	+ 0·6			38·7	38·6	+ 0·1
3000		Sun faint.	41·8	40·2	+ 1·6			41·5	42·4	− 0·9
2000			45·0	43·3	+ 1·7			47·0	46·8	+ 0·2
1000		Misty all round.	45·5	46·5	− 1·0			..	..	..
ground.			48·0	49·9	− 1·9			..	..	..

September 29.—On leaving the earth the temperature decreased from 48° on the ground to 45½° at 1000 feet, and to 1° at 16,000 feet; a warm current having been met with between 12,000 and 13,500 feet. On descending a warm current was passed extending from 14,000 feet to 9000 feet, and afterwards the temperature increased constantly with decrease of elevation till the ground was reached.

TABLE III. (*continued.*)

SIXTEENTH ASCENT.

1863. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
October 9.			°	°	°			°	°	°
7000	From $4^h 27^m$ to $4^h 43^m 30^s$ p.m.	Clear sky.	31·0	30·4	+ 0·6	From $4^h 48^m$ to $5^h 1^m 30^s$ p.m.	Clear sky.	30·7	30·7	0·0
6000			31·6	32·5	− 0·9			31·7	31·7	0·0
5000			35·0	35·0	0·0			33·6	33·6	0·0
4000		Mist on land.	39·8	38·6	+ 1·2			35·8	35·9	− 0·1
3000			42·2	42·2	0·0			39·0	37·4	+ 1·6
2000			46·8	45·8	+ 1·0					
1000			49·8	50·0	− 0·2					
ground.			54·5	54·6	− 0·1					
3000			41·0	..	..	From $5^h 2^m$ to $5^h 8^m$ p.m.	A thin mist.	40·5		
2000				..	..			43·5		
8000	From $5^h 9^m$ to $5^h 55^m 45^s$ p.m.		28·5	28·5	0·0			Too dark to read the instruments.		
7000			29·8	30·3	− 0·5					
6000			32·8	32·9	− 0·1					
5000			35·5	35·5	0·0					
4000		Sudden dryness.	38·0	38·4	− 0·4					
3000			42·2	41·2	+ 1·0					
2000			44·8	43·8	+ 1·0					

October 9.—The temperature before starting from the ground on this day was 54½°, decreasing gradually on ascending till the height of 7300 feet was reached, where it was 30°; the balloon then turned to descend, and the temperature increased gradually to 42° at 2300 feet. On reascending the temperature was found to be 39½° at 3600 feet; it increased to 45° on descending to 1500 feet, and on again ascending declined to 28° at 7200 feet; the decline of temperature after this was very slight, but it became too dark to read the instruments, so that no observations were made either at the highest point reached, or during the descent to the earth.

There were neither warm nor cold currents met with on this day.

TABLE III. (*continued.*)

SEVENTEENTH ASCENT.

1864. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
January 12.			°	°				°	°	°
11000	From $2^h 8^m$ to $3^h 25^m$ p.m.	Fine snow.	14·1			From $3^h 36^m$ to $4^h 3^m 15^s$ p.m.	Snow fine and thin.	13·6		
·10000		Misty.	18·9				Clouds above and below.	16·6		
9000			23·6					20·0		
8000		Colder current.	28·0				Snow.	22·9		
7000			30·8				Near cloud.	24·9		
6000			32·8				Very misty.	29·0		
5000		Cloudy.	36·4					30·0		
4000			38·2					33·0		
3000		Cloud.	44·8				Misty.	36·8		
2000		Calm and warm to sense.	43·8					39·1		
1000		Sensibly warm.	39·1							
ground.			41·5				Misty.	41·8		

EIGHTEENTH ASCENT.

1864. Height, in feet, above the mean level of the sea.	Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
April 6.										
11000	From $4^h 9^m 10^s$ to $4^h 37^m$ p.m.		36·5			From $4^h 37^m$ to $5^h 7^m$ p.m.		39·0		
10000		Sun warm.	35·0					44·3		
9000			34·4				Very warm.	46·2		
8000			39·0					46·2		
7000		Blue sky.	38·7					46·0		
6000			35·5				Entered cloud.	43·9		
5000			36·0					43·0		
4000		Fog	33·0					41·8		
3000		wetting.	33·6					39·7		
2000		Entering clouds, misty.	37·5				Below cloud.	39·7		
1000			41·7					41·7		
ground.		Very misty.	45·5					45·8		

January 12.—The temperature of the air before starting was 41½°; it decreased very slowly till 1300 feet was reached, a warm current was then met with, and at 3000 feet the temperature was nearly 45°, being 3¼° higher than on the ground, and for a space of 3000 feet in height the temperature was higher than on the earth; it then gradually declined to 11° at 11,500 feet, and remained at about this degree till the highest point was reached; on descending it gradually increased with decrease of elevation, till on reaching the ground at $4^h 10^m$ it was 41°·8. The results on this day are so remarkable that no adopted temperature has been attempted.

April 6.—This ascent is remarkable for the small decrease of temperature with increase of elevation. The temperature of the air was 45½° on leaving

the earth, *it did not decline at all* till after 300 feet had been passed, after which it decreased pretty gradually to 33° when 4300 feet was reached; a warm current was then entered, and the temperature increased till 7500 feet was attained, being of the same temperature as has been experienced at 1500 feet high, viz. 40°, then decreased to 34° at 8800 feet, and then increased slowly to 36½° at 11,000 feet, a temperature which had been experienced at the height of 2170 feet in ascending.

On descending the temperature increased about 5° in the first 1000 feet; remained at about that temperature till within 7000 feet of the earth, then gradually decreased to 40° at 3000 feet, remained at about this point till 1500 feet of the earth, and then increased to nearly 46° on the ground. The observed temperatures on this day are so remarkable that no adopted temperatures have been made.

Table III. (*continued.*)

Nineteenth Ascent.

1864. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
June 13.			°	°	°			°	°	°
3000	From 7h to 7h 8m p.m.	Cloudless.	51·5	51·5	0·0		Clear.	51·4	51·5	−0·1
2000			54·2	54·5	−0·3					
1000			58·8	58·5	+0·3					
ground.			61·8	61·5	+0·3					
3000			48·1	48·1	0·0			49·6	49·4	+0·2
3000			51·0	51·0	0·0	From 7h 52m to 8h 14m p.m.		49·0	49·2	−0·2
2000								51·7	51·9	−0·2
1000								54·0	53·9	+0·1
ground.								54·0	54·0	0·0

June 13.—The temperature of the air on the ground before starting was 62°, declining with increase of elevation till 3000 feet was reached, where it was 51½°; on descending the temperature was found to be 54° at 2300 feet; the balloon then reascended, the temperature declining gradually to 3100 feet, then began to increase, being 48½° at 3450 feet, but declined to 47° by passing upwards to 3540 feet; on again descending it increased evenly till at 2700 feet, it being there 51°, and remained about the same for 200 feet; on reascending the temperature scarcely differed from 51° till 3000 feet was gained, when a sudden decrease of 2° occurred in 35 feet; then began our final descent, the temperature remaining the same for 400 feet, then increased to 51½° by 2000 feet, and to 53°·2 at 1800 feet, below which there was scarcely any change till the earth was reached.

This fact of no change in the temperature of the air within 1800 feet of the earth at the time of sunset was very remarkable, for it indicated that if such be a law, the law of decrease of temperature with increase of elevation may be reversed at night for some distance from the earth.

Table III. (*continued.*)

Twentieth Ascent.

1864. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what time.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
June 20.			°	°	°			°	°	°
4000	From 6h 17m to 6h 31m p.m.	In clouds.	52·4	51·4	+1·0	From 6h 31m to 6h 35m p.m.	In cloud.	51·2	51·1	+0·1
3000		Entering clouds	54·0	54·0	0·0		Out of cloud.	52·9	53·9	−1·0
2000		Misty.	58·1	58·1	0·0					
1000			62·4	62·4	0·0					
ground.			66·5	66·6	+0·1					
4000	From 6h 41m to 6h 48m p.m.	In clouds.	50·6	51·4	−0·8	From 6h 48m to 7h 16m p.m.	In cloud.	49·9	50·2	−0·3
3000			54·0	53·9	+1·2			54·1	54·5	−0·4
2000							Can see the earth.	61·1	59·8	+1·3
1000							Misty.	62·0	62·8	−0·8
ground.								64·6	64·7	−0·1

Twenty-first Ascent.

1864. Height, in feet, above the mean level of the sea.	Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what time.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
June 27.										
5000	From 6h 33m 30s to 7h 41m p.m.		42·3	41·7	+0·6	From 7h 41m to 8h 52m p.m.	Very misty.	42·3	41·7	+0·6
4000			43·7	43·7	0·0			41·6	41·6	0·0
3000		Sun clear.	49·4	48·2	+1·2			42·7	44·0	−1·3
2000			52·4	52·2	+0·2			47·0	47·4	−0·4
1000		Misty.	56·7	56·9	−0·2			48·9	48·9	0·0
ground.			63·0	67·1						
4000	From 8h 56m 30s to 9h 4m p.m.		45·0	44·8	+0·2					
3000			46·8	46·8	0·0					
2000			46·7	47·6	+0·9					
1000			48·5	48·5	0·0					
ground.										

June 20.—The temperature of the air on the ground before starting was 66½°, which declined very gradually to 4100 feet, where it was 51°. On descending it increased gradually till 2700 feet was reached, it then being 54°. On ascending to 4200 feet, the temperature fell to 49½°. On descending for the last time, it increased to 61° at 2000 feet, and to 64½° on the ground: this was about one hour before sunset, showing in the last 2000 feet an increase of temperature of 3°, thus showing that the usual law holds good to this time, but apparently with far less energy, as on ascending the decrease of temperature in the same space was three times as large, or 9°.

June 27—On this occasion the temperature was 63° on the ground, gradually decreasing to 1000 feet, where it was nearly 57°, then declined 1½° in 200 feet, then gradually to 2600 feet, when a comparatively warmer current was met with, the temperature declining only 1½° in the following 900 feet,

decreased more rapidly in the next 600 feet, and remained nearly stationary during the following 900 feet, it being at 5000 feet rather more than 42°.

On *descending* it slightly *declined* in the first 300 feet, then increased slowly till 2000 feet, after which it was nearly stationary till within 400 feet of the earth, where it was 49°.

On reascending it declined very slowly till 4000 feet was attained, it being then 46°, after which it became too dark to read the thermometers; this was a matter of great regret, for the balloon passed above 6000 feet; the temperature was found to be 46½° on the ground.

Table III. (*continued.*)

Twenty-second Ascent.

1864. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what time.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
August 29.			°	°	°			°	°	°
15000	From 4^h 6^m 20^s to 4^h 49^m 30^s p.m.	Clear blue sky.	33·0	32·9	+0·1	From 4^h 49^m 30^s to 5^h 32^m p.m.	Clear blue sky.	33·0	32·9	+0·1
14000			34·8	33·8	+1·0			29·0	33·1	−4·1
13000			33·0	35·3	−2·3			30·7	33·7	−3·0
12000			35·1	36·8	−1·7			31·9	34·3	−2·4
11000			39·2	38·5	+0·7			32·7	34·9	−2·2
10000			41·0	41·0	0·0			33·8	36·8	−3·0
9000			42·7	43·4	−0·7			37·5	38·7	−1·2
8000			48·0	46·0	+2·0			41·2	41·2	0·0
7000			51·1	48·8	+2·3			44·3	44·0	+0·3
6000			53·4	51·7	+1·7			46·9	47·0	−0·1
5000			54·4	54·8	−0·4			49·0	50·1	−1·1
4000			57·5	58·1	−0·6			53·0	53·7	−0·7
3000			62·8	61·8	+1·0			58·5	57·4	+1·1
2000			67·4	65·8	+1·6			61·8	61·0	+0·8
1000			71·0	70·0	+1·0			65·5	65·0	+0·5
ground.			72·5	74·3	−1·8			69·0	69·0	0·0

August 29.—On the ground the temperature of the air was 72½°; on ascending several warm and cold currents were passed through; the temperature was 33° on reaching the highest point, viz. 15,000 feet; on descending the increase of temperature to 14,000 feet was as much as 4°, having entered a cold current which continued till 9000 feet was passed; from 8000 feet the increase of temperature was very regular, and continued so till the earth was reached.

It is very clear from the numbers in the following Table, that they differ very much from those in previous years, and that they cannot be combined, or all used in deducing general laws. The ascent on August 31 was made in the evening with a partially clear sky, and the results are somewhat abnormal. Some of the numbers in January 12 and April 6 are affected by + signs, circumstances never before met with; on June 13, at sunset, no difference was found within 2000 feet of the earth; and those of June 20, made a little before sunset, and those of June 27, made a little before and after sunset, all seem to differ from the general laws as found by experiments made when the sun is situated at a good altitude.

The only experiments this year which can be combined with previous results are those of September 29 with a cloudy sky, those of October 9 and August 29, mostly with clear skies.

It is certain from the numbers in this Table that there are at times, in the higher regions of the earth's atmosphere, spaces subjected to great cold, and others to considerable heat; and from the notes made at the time of passing through clouds, that there exist some clouds of very low temperature, and some, as those of January 12, of high temperature.

The presence of such either cold or hot currents passing over the country must play an important part in all our meteorological phenomena, and must exert a great influence upon our climate.

The numbers in columns 24 and 26 show the mean results from the experiments of the year, the former when the sky was cloudy, September 29, and the latter when clear or mostly clear, on October 9 and August 29.

The numbers in column 25 show the number of experiments upon which each result in column 24 is based; at heights up to 5000 feet these vary from 13 to 22, at 6000 feet and 7000 feet to 5 and 7, and to heights exceeding 7000 feet to 4, these having been made on two days only, viz. June 26 and September 29, 1863, on which days the balloon was frequently enveloped in fog and clouds to the height of 3 and 4 miles.

The numbers in column 32 show the total number of experiments upon which the numbers in column 31 are based; they vary from 7 to 17 up to the height of 23,000 feet, and there can be but little doubt that the numbers in column 31 are very nearly true, and approximate closely to the general law. Above 24,000 feet the number of experiments are too few to speak confidently upon them, but they are in accordance with the series below this elevation.

The numbers in column 28 show the decrease of temperature at each 1000 feet increase of elevation with a cloudy sky, they differ from those in column 31, showing the decrease for the same space with a clear sky, the former being smaller, the latter up to the usual height of the cloud plane, and are nearly alike above that plane, but the observations of cloudy skies at heights exceeding 5000 and 6000 feet, are too few to place great confidence in them.

In forming the last six columns of the following Table, no use has been made of the observations taken on July 17, 1862, August 31, 1863, January 12, April 6, June 13, 20, and 27 of the year 1864. The results on all those days are abnormal; I defer studying the results on these days till I can compare them with some confidence with the general laws, which may be found to hold good at times of the year at which they were made; their study then will be profitable, and probably fruitful in yielding valuable results.

The numbers in column 30 show the average increase of elevation at every 1000 feet for a decrease of 1° with a cloudy sky; from these we see that up to 1000 feet the average space is 223, the space for each 1000 feet increasing, till at 22,000 feet it requires more than 1000 feet for a change of 1° of temperature.

Table IV.—Showing the decrease of Temperature in every 1000 feet of elevation up to 29,000 feet.

Height above the level of the sea.		August 31, 1863.			Sept. 29, 1863.		October 9, 1863.			January 12, 1864.		April 6, 1864.		June 13, 1864.	
		State of the Sky.													
		In cloud at 1000 ft. Clear above.	Cloudy below 3000 ft.	Uniform Mist.	Cloudy.		Clear.			Misty.		Cloudy.		Clear.	
From	To	Ascending.	Descending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.
ft.	ft.	°	°	°	°	°	°	°	°	°	°	°	°	°	°
28000	29000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
27000	28000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26000	27000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
25000	26000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24000	25000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23000	24000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22000	23000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21000	22000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20000	21000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19000	20000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18000	19000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17000	18000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16000	17000	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15000	16000	...	...	...	2·8	3·2	...	...	...	...	...	...	...	...	...
14000	15000	...	...	...	2·9	2·6	...	...	...	...	...	...	...	...	...
13000	14000	...	...	...	3·3	3·6	...	...	...	...	...	...	...	...	...
12000	13000	...	...	...	3·0	3·2	...	...	...	...	...	...	...	...	...
11000	12000	...	...	...	2·9	3·1	...	...	...	...	...	...	...	...	...
10000	11000	...	...	...	2·8	3·2	...	...	...	4·8	4·0	−1·5	5·3	...	...
9000	10000	...	...	...	2·9	2·9	...	...	...	4·7	3·4	−0·6	1·9	...	...
8000	9000	...	...	...	2·9	2·9	...	...	...	4·4	2·9	+4·6	0·0	...	...
7000	8000	1·3	1·6	...	3·1	3·2	...	...	1·8	2·8	2·0	−0·3	−0·2	...	...
6000	7000	2·9	1·6	...	2·9	3·1	2·1	1·0	2·6	2·0	4·1	−3·2	−2·1	...	...
5000	6000	2·4	1·6	...	3·2	3·1	2·5	1·9	2·6	3·6	3·0	+0·5	−0·9	...	...
4000	5000	3·1	2·2	...	3·0	2·9	3·6	2·3	2·9	1·8	3·8	−3·0	−1·2	...	...
3000	4000	3·0	2·5	...	3·0	3·8	3·6	...	2·8	+6·6	2·3	+0·6	−2·1	...	...
2000	3000	3·1	2·8	...	3·1	4·4	3·6	...	2·6	−1·0	...	3·9	0·0	3·0	2·7
1000	2000	3·2	3·1	1·3	3·2	5·0	4·2	...	...	−4·7	...	4·2	+2·0	4·0	2·0
0	1000	9·1	...	2·4	3·4	5·1	4·6	...	...	+2·4	...	3·8	+4·1	3·0	0·1
No. of Col.		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.

Height above the level of the sea.		June 20, 1864.				June 27, 1864.			Aug. 29, 1864.		Mean.				General Means (omitting July 17, 1862, Aug. 31, 1863, Jan. 12, April 6, June 13, 20, 27, 1864).					
		State of the Sky.																		
		Cloudy.				Partially Clear.			Clear.						Cloudy.			Clear.		
From	To	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Ascending.	Descending.	Cloudy.	Number of experiments.	Clear.	Number of experiments.	Mean.	Number of experiments.	Space passed for a decline of 1°.	Mean.	Number of experiments.	Space passed for a decline of 1°.
ft.	ft.	°	°	°	°	°	°	°	°	°	°		°	°	°		feet.	°		feet.
28000	29000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·8	1	1250
27000	28000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·9	1	1111
26000	27000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·0	1	1000
25000	26000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·0	1	1000
24000	25000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·1	2	909
23000	24000	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·3	2	771
22000	23000	...	...	...	...	...	...	...	...	...	...	...	...	...	0·8	2	1250	1·0	4	1000
21000	22000	...	...	...	...	...	...	...	...	...	...	...	...	...	0·8	2	1250	1·1	7	911
20000	21000	...	...	...	...	...	...	...	...	...	...	...	...	...	1·1	2	911	1·2	7	833
19000	20000	...	...	...	...	...	...	...	...	...	...	...	...	...	0·9	2	909	1·3	7	771
18000	19000	...	...	...	...	...	...	...	...	...	...	...	...	...	1·4	2	715	1·5	7	666
17000	18000	...	...	...	...	...	...	...	...	...	...	...	...	...	1·3	2	771	1·7	7	588
16000	17000	...	...	...	...	...	...	...	...	...	...	...	...	...	1·2	2	833	1·9	7	526
15000	16000	...	...	...	...	...	...	...	...	...	3·0	2	...	2	2·1	4	477	2·2	9	455
14000	15000	...	...	...	...	...	...	...	0·9	0·2	2·8	2	0·5	2	2·0	4	500	1·7	9	588
13000	14000	...	...	...	...	...	...	...	1·5	0·6	3·4	2	1·0	2	2·3	4	435	2·0	11	500
12000	13000	...	...	...	...	...	...	...	1·5	0·6	3·1	2	1·0	2	2·2	4	455	2·2	11	455
11000	12000	...	...	...	...	...	...	...	2·0	0·6	3·0	2	1·3	2	2·2	4	455	2·3	11	435
10000	11000	...	...	...	...	...	...	...	2·2	1·9	3·0	2	2·0	2	2·2	4	455	2·6	13	385
9000	10000	...	...	...	...	...	...	...	2·4	1·9	2·9	2	2·2	2	2·2	4	455	2·4	12	417
8000	9000	...	...	...	...	...	...	...	2·6	2·5	2·9	2	2·6	2	2·2	4	455	2·5	12	400
7000	8000	...	...	...	...	...	...	...	2·8	2·8	3·2	2	2·5	3	2·4	4	417	2·7	12	371
6000	7000	...	...	...	...	...	...	...	2·9	3·0	3·0	2	2·3	5	2·7	5	371	2·5	15	401
5000	6000	...	...	...	...	...	...	...	3·2	3·1	3·2	2	2·7	5	3·2	7	313	2·6	17	385
4000	5000	...	...	...	...	2·0	−0·1	...	3·2	3·6	3·0	2	3·1	5	3·3	13	303	2·9	12	345
3000	4000	2·6	2·8	1·4	4·3	4·0	+2·4	2·0	3·7	3·7	3·4	2	3·5	4	3·4	20	295	3·3	12	304
2000	3000	4·1	...	...	5·3	4·0	1·4	0·8	4·0	3·6	3·8	2	3·5	4	3·7	22	271	3·8	11	264
1000	2000	4·3	...	...	3·0	4·7	1·5	0·9	4·2	4·0	4·1	2	4·1	3	3·6	21	278	4·7	9	213
0	1000	4·2	...	...	1·9	1·9	0·2	...	4·3	4·0	4·3	2	4·3	3	4·5	17	223	6·2	9	162
No. of Col.		15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.

In the last column of Table IV. the same results are shown for clear, or nearly clear skies, and they show that a change of 1° takes place for an average increase of 162 feet; this space gradually increasing to 1000 feet at 23,000 feet.

By comparing the numbers in columns 30 and 33 together, the different spaces required to be passed through for a decline of 1° of temperature in the two states of the sky will be readily seen: up to 23,000 feet it is necessary to pass through a much larger change of elevation with a cloudy sky for a decline of 1° of temperature than with a clear sky.

Cloudy Sky.

By adding together successively the numbers in column 28, we shall find the whole decrease of temperature from the earth to the different elevations; the results with a cloudy sky are as follows:—

	feet		feet		°			feet.
From	0	to	1,000	the decrease was	4·5,	or 1° on the average of		223
		,,	2,000	,,	8·1		,,	247
		,,	3,000	,,	11·8		,,	255
		,,	4,000	,,	15·2		,,	263
		,,	5,000	,,	18·5		,,	271
		,,	6,000	,,	21·7		,,	277
		,,	7,000	,,	24·4		,,	287
		,,	8,000	,,	26·8		,,	299
		,,	9,000	,,	29·0		,,	311
		,,	10,000	,,	31·2		,,	321
		,,	11,000	,,	33·4		,,	329
		,,	12,000	,,	35·6		,,	337
		,,	13,000	,,	37·8		,,	344
		,,	14,000	,,	40·1		,,	349
		,,	15,000	,,	42·1		,,	356
		,,	16,000	,,	44·2		,,	362
		,,	17,000	,,	45·4		,,	375
		,,	18,000	,,	46·7		,,	386
		,,	19,000	,,	48·1		,,	395
		,,	20,000	,,	49·0		,,	409
		,,	21,000	,,	50·1		,,	419
		,,	22,000	,,	50·9		,,	432
		,,	23,000	,,	51·7		,,	445

These results, showing the whole decrease of temperature of the air from the earth up to 23,000 feet, differ very considerably from those with a clear sky, to be spoken of presently. The numbers in the last column show the average increment of height for a decline of 1°, as found by using the temperatures of the extremities of the column above. To 1000 feet high the average is 1° in 223 feet, increasing gradually to 1° in 445 feet at 23,000 feet.

Clear Sky.

By adding together the numbers in column 31 in the same way the following results are found:—

	feet		feet		°			feet.
From	0	to	1,000	the decrease was	6·2,	or 1° on the average of		162
		,,	2,000	,,	10·9		,,	184
		,,	3,000	,,	14·7		,,	204
		,,	4,000	,,	18·0		,,	223
		,,	5,000	,,	20·9		,,	239
		,,	6,000	,,	23·5		,,	256
		,,	7,000	,,	26·0		,,	271
		,,	8,000	,,	28·7		,,	279
		,,	9,000	,,	31·2		,,	289
		,,	10,000	,,	33·6		,,	298
		,,	11,000	,,	35·6		,,	309
		,,	12,000	,,	37·9		,,	317
		,,	13,000	,,	40·1		,,	324
		,,	14,000	,,	42·1		,,	333
		,,	15,000	,,	43·8		,,	343
		,,	16,000	,,	46·0		,,	348
		,,	17,000	,,	47·9		,,	355
		,,	18,000	,,	49·6		,,	363
		,,	19,000	,,	51·1		,,	372
		,,	20,000	,,	52·4		,,	382
		,,	21,000	,,	53·6		,,	392
		,,	22,000	,,	54·7		,,	405
		,,	23,000	,,	55·7		,,	413
		,,	24,000	,,	57·0		,,	422
		,,	25,000	,,	58·1		,,	431
		,,	26,000	,,	59·1		,,	441
		,,	27,000	,,	60·1		,,	449
		,,	28,000	,,	61·0		,,	459
		,,	29,000	,,	61·8		,,	469
		,,	30,000	,,	62·3		,,	482

These results, showing the whole decrease of temperature from the ground to 30,000 feet, differ greatly, as just mentioned, from those with a cloudy sky.

The numbers in the last column, showing the average increase of height for a decline of 1° of temperature from the ground to that elevation, are all smaller than those with a cloudy sky at the same elevation. Each result is based upon at least seven experiments, taken at different times of the year, and up to this height considerable confidence may be placed in the results; they show that a change takes place in the first 1000 feet of 1° on an average of 162 feet, increasing to about 300 feet at 10,000 feet; in the year 1862 this space of 300 feet was at 14,000 feet high, and in 1863 at 12,000 feet high, therefore the changes of temperature have been less in 1863 than those in 1862, and also less in 1864 than in 1863; but the experiments have all been taken at different times of the year.

Without exception the fall of 1° has always taken place in the smallest space when near the earth. To determine this space, and also the law of decrease near the earth, all the observations of temperature of the air up to 5000 feet were laid down on large diagrams, and a line was made to pass through them, giving equal weight to every observation; the result at every 200 feet was then read out, and in this way the next series of Tables were formed.

TABLE V.—Showing the Mean Temperature of the Air at every 200 feet up to 5000 feet.—FOURTEENTH ASCENT.

1863. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
August 31.			°	°	°			°	°	°
5000	From $6^{h}\ 7^{m}$ p.m. to $6^{h}\ 20^{m}\ 30^{s}$ p.m.		42·8	41·5	+1·3	From $6^{h}\ 44^{m}$ p.m. to $6^{h}\ 53^{m}\ 20^{s}$ p.m.		38·9	38·8	+0·1
4800			43·2	42·2	+1·0		In basin of clouds.	39·2	39·1	+0·1
4600			43·6	42·9	+0·7			39·6	39·6	0·0
4400		Very cold.	45·1	43·4	+0·7			40·1	40·1	0·0
4200			45·2	44·0	+1·2		Getting into clouds.	40·7	40·6	+0·1
4000			45·2	44·6	+0·6			41·5	41·0	+0·5
3800			45·2	45·2	0·0		Just in cloud.	44·1	41·5	−0·4
3600			46·3	45·8	+0·5			42·1	42·0	+0·1
3400			47·0	46·4	+0·6		In white mist.	42·4	42·5	−0·1
3200			47·4	47·0	+0·4			43·0	43·0	0·0
3000			47·5	47·6	−0·1			43·2	43·5	−0·3
2800		Cumulus on our level.	47·7	48·2	−0·5		Leaden sky above.	44·1	44·1	0·0
2600			50·7	48·8	+1·9			44·8	44·7	+0·1
2400			50·7	49·4	+1·3			45·1	45·2	−0·1
2200			50·9	50·0	+0·9			45·7	45·7	0·0
2000			51·3	50·7	+0·6			46·3	46·3	0·0
1800			51·9	51·4	+0·5			46·9	46·9	0·0
1600			52·4	52·0	+0·4		Stratum of clouds above.	47·5	47·5	0·0
1400			52·8	52·6	+0·2			48·0	48·1	−0·1
1200		Above clouds.	53·3	53·2	+0·1			48·3	48·8	−0·5
1000			54·9	53·9	+1·0			49·0	49·4	−0·4
800		Entering into cloud.	55·7	54·8	+0·9			50·3		
600			55·8	55·9	−0·1			53·7		
400			56·0	57·4	−1·4					
200			56·0	59·4	−3·4					
ground.			64·0	64·0	0·0					
2000	From $6^{h}\ 53^{m}\ 20^{s}$ p.m. to $6^{h}\ 55^{m}$ p.m.		50·0	...	...	From $6^{h}\ 55^{m}$ p.m. to $7^{h}\ 5^{m}$ p.m.		50·2	50·2	0·0
1800			50·6	...	...			50·4	50·4	0·0
1600			50·3	...	...			50·5	50·5	0·0
1400			50·9	...	...			50·5	50·7	−0·2
1200		In clouds.	51·0	...	...		In uniform mist.	50·5	51·1	−0·6
1000			51·0	...	...			51·0	51·5	−0·5
800			50·5	...	...			53·1	52·0	+1·1
600			...	...	...			53·7	52·5	+1·2
400			...	...	...			53·7	53·0	+0·7
200			...	...	...			53·4	52·4	+1·0
ground.			...	...	...			53·5	53·9	−0·4

TABLE V. (*continued.*)

FIFTEENTH ASCENT.

1863. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
September 29.			°	°	°			°	°	°
5000	From $7^{h}\ 42^{m}$ a.m. to $7^{h}\ 58^{m}\ 30^{s}$ a.m.		35·6	34·2	+ 1·4	From $10^{h}\ 13^{m}$ a.m. to $10^{h}\ 23^{m}$ a.m.	...	35·7	35·7	0·0
4800			36·0	34·7	+ 1·3		...	36·0	36·0	0·0
4600			36·6	35·3	+ 1·3		...	36·8	36·5	+ 0·3
4400			37·1	36·0	+ 1·1		...	37·6	37·0	+ 0·6
4200			37·4	36·6	+ 0·8		...	38·5	37·8	+ 0·7
4000			37·8	37·2	+ 0·6		...	38·7	38·6	+ 0·1
3800			38·6	37·8	+ 0·8		...	38·4	39·2	− 0·8
3600			40·0	38·4	+ 1·6		...	38·5	39·8	− 1·3
3400			41·2	39·0	+ 2·2		...	40·3	40·7	− 0·4
3200			41·7	39·6	+ 2·1		...	41·2	41·6	− 0·4
3000		Sun faint.	41·8	40·2	+ 1·6		...	41·5	42·4	− 0·9
2800			42·1	40·8	+ 1·3		...	42·2	43·1	− 0·9
2600			43·8	41·4	+ 2·4		...	43·1	43·8	− 0·7
2400			44·0	42·1	+ 1·9		...	45·0	44·7	+ 0·3
2200			45·0	42·7	+ 2·3		...	46·4	45·8	+ 0·6
2000			45·0	43·3	+ 1·7		...	47·0	46·8	+ 0·2
1800			45·0	43·9	+ 1·1		...	48·0	47·8	+ 0·2
1600			45·0	44·6	+ 0·4		...	49·0	48·8	+ 0·2
1400			45·0	45·2	− 0·2		...	...	50·0	
1200			45·0	45·9	− 0·9		...	...	51·0	
1000		Misty all round.	45·5	46·5	− 1·0		...	...	51·8	
800			46·0	47·1	− 1·1		...	...	52·6	
600			47·1	47·7	− 0·6		...	...	53·4	
400			47·8	48·5	− 0·7		...	...	54·5	
200			47·9	49·2	− 1·3		...	...	55·7	
ground.			48·0	49·9	− 1·9		...	...	56·9	

SIXTEENTH ASCENT.

1863. Height, in feet, above the mean level of the sea.	Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
October 9.										
5000	From $4^{h}\ 27^{m}$ p.m. to $4^{h}\ 37^{m}$ p.m.		35·0	35·0	0·0	From $4^{h}\ 53^{m}$ p.m. to $5^{h}\ 14^{m}\ 30^{s}$ p.m.	...	33·6	33·6	0·0
4800		Clear sky.	35·7	35·8	− 0·1		...	34·0	31·7	+ 2·3
4600			34·2	36·7	− 2·5		...	34·5	33·6	+ 0·9
4400			36·8	37·4	− 0·6		...	35·0	34·0	+ 1·0
4200			37·5	38·0	− 0·5		...	33·8	34·5	− 0·7
4000			39·8	38·6	+ 1·2		...	35·8	35·9	+ 0·1
3800			40·8	39·3	+ 1·5		...	36·5	35·5	+ 1·0
3600			41·2	40·1	+ 1·1		...	37·0	35·9	+ 1·1
3400			41·5	40·8	+ 0·7		...	37·5	36·5	+ 1·0
3200			41·9	41·5	+ 0·4		...	38·3	36·9	+ 1·4
3000		Mist over land.	42·2	42·2	0·0		...	39·0	37·4	+ 1·6
2800			42·8	42·9	− 0·1		...	40·7	37·9	+ 2·8
2600			43·1	43·6	− 0·5		...	41·0		
2400			45·0	44·3	+ 0·7					
2200			45·7	45·0	+ 0·7					
2000			46·8	45·8	+ 1·0					
1800			47·7	46·6	+ 1·1					
1600			48·1	47·4	+ 0·7					
1400			48·8	48·2	+ 0·6					
1200			49·1	49·1	0·0					
1000			49·8	50·0	− 0·2					
800			52·5	50·9	+ 1·6					
600			52·7	51·9	+ 0·8					
400			53·0	52·8	+ 0·2					
200			53·7	53·7	0·0					
ground.			54·5	54·6	− 0·1					

TABLE V. (*continued.*)

SIXTEENTH ASCENT (*continued.*)

1864. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
Oct. 9 (*cont.*).			°	°	°			°	°	°
3200	From 5^{h} 14^{m} p.m. to 5^{h} 25^{m} p.m.		40·6	...	...	From 5^{s} 25^{m} p.m. to 5^{s} 36^{m} p.m.		40·3		
3000			41·0	...	...			40·5		
2800			42·5	...	...			40·9		
2600			42·8	...	...			41·3		
2400			...	...	...			41·9		
2200			...	...	...			42·4		
2000			...	...	...			43·5		
1800			...	...	...		A thin mist.	44·4		
1600			...	...	...			44·5		
1400			...	...	...			44·7		
5000	From 5^{h} 36^{m} 40^{s} p.m. to 5^{h} 48^{m} 30^{s} p.m.		35·5	35·5	0·0			Too dark to read the instruments.		
4800			36·1	36·1	0·0					
4600			36·9	36·9	0·0					
4300			37·2	37·1	+ 0·1					
4200			37·8	37·8	0·0					
4000			38·0	38·4	− 0·4					
3800			38·5	39·0	− 0·5					
3600			39·4	39·6	− 0·2					
3400			40·4	40·1	+ 0·3					
3200		A sudden dryness.	41·3	40·6	+ 0·7					
3000			42·2	41·2	+ 1·0					
2800			43·3	41·8	+ 1·5					
2600			44·4	42·4	+ 2·0					
2400			44·7	42·9	+ 1·8					
2200			44·8	43·3	+ 1·5					
2000			44·8	43·8	+ 1·0					
1800			44·8	44·3	+ 0·5					
1600			44·8	44·8	0·0					
1400			44·7	45·3	− 0·6					

SEVENTEENTH ASCENT.

Height	Asc. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Desc. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
Jan. 12, 1864.										
5000	From 2^{h} 8^{m} p.m. to 2^{h} 31^{m} p.m.		36·4	...	...	From 3^{h} 54^{m} 30^{s} p.m. to 4^{h} 4^{m} 30^{s} p.m.	Very misty.	30·0		
4800			36·6	...	...			31·3		
4600			37·0	...	...			31·9		
4400			37·3	...	...			31·5		
4200		Sudden change of temp.	37·8	...	...			32·5		
4000			38·2	...	...			33·0		
3800			41·5	...	...			33·7		
3600			42·5	...	...			34·5		
3400			43·0	...	...			35·2		
3200			44·2	...	...			36·1		
3000		Calm and warm to sense.	44·8	...	...			36·8		
2800			44·5	...	...			37·5		
2600			44·2	...	...			38·4		
2400			44·1	...	...			38·5		
2200			44·0	...	...			38·8		
2000		Quite warm.	43·8	...	...			39·1		
1800			43·0	...	...			39·2		
1600		Sensibly warm.	41·1	...	...			39·4		
1400			40·5							
1200			38·9							
1000			39·1							
800			39·5							
600			39·7							
400			40·7							
200			41·1							
ground.			41·5							

TABLE V. (*continued.*)

EIGHTEENTH ASCENT.

1864. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
April 6.			°	°	°			°	°	°
5000	From 4^{h} 9^{m} p.m. to 4^{h} 22^{m} p.m.		36·0	...	...	From 4^{s} 52^{m} p.m. to 5^{s} 7^{m} p.m.		43·0		
4800			35·8	...	...			42·8		
4600			35·0	...	...			42·5		
4400			34·2	...	...			42·3		
4200			33·0	...	...			42·2		
4000			33·0	...	...			41·8		
3800			33·0	...	...			41·2		
3600			33·0	...	...			41·0		
3400		Fog wetting.	33·5	...	...			41·0		
3200			33·5	...	...			40·1		
3000			33·6	...	...			39·7		
2800			35·0	...	...			39·2		
2600			36·5	...	...			39·5		
2400		Very misty; entering cloud.	36·2	...	...			39·5		
2200			37·0	...	...			39·6		
2000			37·5	...	...		Below cloud.	39·7		
1800			38·3	...	...			40·1		
1600			39·5	...	...			40·0		
1400			40·8	...	...			40·4		
1200			41·1	...	...			40·8		
1000		Very misty.	41·7	...	...			41·7		
800			42·4	...	...			42·4		
600			44·2	...	...			43·2		
400			45·2	...	...			45·2		
200			45·5	...	...			45·5		
ground.			45·5	...	...			45·8		

NINETEENTH ASCENT.

Height	Asc. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Desc. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
June 13.										
3000	From 7^{h} to 7^{h} 8^{m} p.m.		51·5	51·5	0·0	From 7^{h} 8^{m} to 7^{h} 11^{m} 15^{s} p.m.	...	51·4	51·5	− 0·1
2800			52·4	52·3	+ 0·1		...	51·6	51·7	− 0·1
2600			52·7	52·7	− 0·5		...	52·2	52·4	− 0·2
2400			52·4	53·4	− 1·0		...	53·1	53·3	− 0·2
2200			54·0	53·6	+ 0·4					
2000			54·2	54·5	− 0·3					
1800			55·1	55·2	− 0·1					
1600		Cloudless.	56·1	56·1	0·0					
1400			56·9	57·1	− 0·2					
1200			57·6	57·8	− 0·2					
1000			58·8	58·5	+ 0·3					
800			59·1	58·9	+ 0·2					
600			59·2	59·4	− 0·2					
400			59·7	59·8	− 0·1					
200			60·8	60·5	+ 0·3					
ground.			61·8	61·5	+ 0·3					
3400	From 7^{h} 13^{m} 45^{s} to 7^{h} 19^{m} 30^{s} p.m.		48·0	48·0	0·0	From 7^{h} 20^{m} to 7^{h} 35^{m} 30^{s} p.m.	...	47·0	46·8	+ 0·2
3200			46·9	47·0	− 0·1		...	48·2	48·5	− 0·3
3000			48·1	48·1	0·0		...	49·6	49·4	+ 0·2
2800			49·6	49·5	+ 0·1		...	50·8	50·8	0·0
2600			50·8	50·5	+ 0·3		...	51·0	51·0	0·0
2400			51·2	51·5	− 0·3					

TABLE V. (*continued.*)

NINETEENTH ASCENT (*continued*).

1864. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
June 13 (*con.*).			°	°	°			°	°	°
3000	...	...	51·0	51·0	0·0	From 7h 52m p.m. to 8h 14m p.m.	...	49·0	49·2	− 0·2
2800	...	...	51·5	51·5	0·0		...	49·0	49·5	− 0·5
2600	...	...	51·0	51·0	0·0		...	49·1	50·0	− 0·8
2400	...	...	...	...	...		...	50·3	50·5	− 0·2
2200	...	...	...	...	...		...	51·1	51·0	+ 0·1
2000	...	...	...	...	...		...	51·7	51·9	− 0·2
1800	...	...	...	...	...		...	53·3	52·8	+ 0·5
1600	...	...	...	...	...		...	53·7	53·4	+ 0·3
1400	...	...	...	...	...		...	53·8	53·7	+ 0·1
1200	...	...	...	...	...		...	53·9	53·8	+ 0·1
1000	...	...	...	...	...		...	54·0	53·9	+ 0·1
800	...	...	...	...	...		...	54·0	54·0	0·0
600	...	...	...	...	...		...	54·0	54·0	0·0
400	...	...	...	...	...		...	54·0	54·0	0·0
200	...	...	...	...	...		...	54·0	54·0	0·0
ground.	...	...	...	...	...		...	54·0	54·0	0·0

TWENTIETH ASCENT.

Height	Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
June 20.										
4000	From 6h 17m to 6h 27m 15s p.m.	In clouds.	52·4	51·4	+ 1·0	From 6h 31m to 6h 35m p.m.	...	51·2	51·4	− 0·2
3800			52·1	51·9	+ 0·2		...	51·2	51·5	− 0·1
3600			52·4	52·4	0·0		...	51·6	51·3	+ 0·3
3400			53·1	53·2	− 0·1		...	51·9	51·5	+ 0·4
3200			54·0	53·5	+ 0·5		...	52·0	52·0	0·0
3000			54·0	54·0	0·0		...	52·9	53·9	+ 1·0
2800			54·3	54·7	− 0·4		...	53·2	53·5	− 0·3
2600			55·9	55·5	+ 0·4					
2400			57·1	56·6	+ 0·5					
2200			58·1	57·4	+ 0·7					
2000			58·1	58·1	0·0					
1800			58·1	58·7	− 0·6					
1600			59·1	59·5	− 0·4					
1400			60·8	60·4	+ 0·4					
1200			61·7	61·5	+ 0·2					
1000			62·4	62·4	0·0					
800			63·0	63·2	− 0·2					
600			64·2	64·0	+ 0·2					
400			65·2	64·9	+ 0·3					
200			66·0	65·8	+ 0·2					
ground.			66·5	66·6	− 0·1					

TABLE V. (*continued.*)

TWENTIETH ASCENT (*continued*).

1864. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
June 20.			°	°	°			°	°	°
4200	From 6h 37m 45s to 6h 49m 15s p.m.	...	50·0	50·0	0·0	From 6h 54m 15s to 7h 16m p.m.	...	49·3	49·6	−0·3
4000		...	50·6	51·4	−0·8		...	49·9	50·2	−0·3
3800		...	50·9	52·0	−1·1		...	50·2	51·0	−0·8
3600		...	53·2	52·6	+0·6		...	50·8	51·8	−1·0
3400		...	53·7	53·2	+0·5		...	51·2	52·6	−1·4
3200		...	54·0	53·6	+0·4		...	52·0	53·5	−1·5
3000		...	54·0	53·9	+0·1		...	54·1	54·5	−0·4
2800		...	53·9	54·0	−0·1		...	56·4	55·5	+0·9
2600		...	...	...	...		...	58·0	56·6	+1·4
2400		...	...	...	...		...	58·8	57·7	+1·1
2200		...	...	...	...		...	60·2	58·7	+1·5
2000		...	...	...	...		...	61·1	59·8	+1·3
1800		...	...	...	...		...	60·9	60·6	+0·3
1600		...	...	...	...		...	60·7	61·2	−0·5
1400		...	...	...	...		...	60·5	61·7	−1·2
1200		...	...	...	...		...	61·1	62·2	−1·1
1000		...	...	...	...		Misty.	62·0	62·8	−0·8
800		...	...	...	...		...	62·6	63·0	−0·4
600		...	...	...	...		...	63·2	63·5	−0·3
400		...	...	...	...			64·0	64·1	−0·1
200		...	...	...	...			64·3	64·5	−0·2
ground.		...	...	...	...			64·6	64·7	−0·1

TWENTY-FIRST ASCENT.

Height	Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
June 27.										
5000	From 6h 33m 30s to 7h 41m p.m.		42·3	41·7	+0·6	From 7h 41m to 8h 54m 30s p.m.	...	42·3	41·7	+0·6
4800			43·3	41·9	+1·4		...	41·5	41·5	0·0
4600			43·3	42·2	+1·1		...	41·2	41·2	0·0
4400			43·1	42·7	+0·4		...	41·2	41·2	0·0
4200			42·9	43·0	−0·1		...	41·3	41·3	0·0
4000			43·7	43·7	0·0		...	41·6	41·6	0·0
3800			44·7	44·7	0·0		...	41·9	42·0	−0·1
3600			46·0	45·7	+0·3		...	42·0	42·5	−0·5
3400			46·8	46·6	+0·2		...	42·2	43·0	−0·8
3200			48·0	47·4	+0·6		...	42·5	43·5	−1·0
3000		Sun clear.	49·4	48·2	+1·2		...	42·7	44·0	−1·3
2800			49·5	49·0	+0·5		...	43·5	44·6	−1·1
2600			50·1	49·8	+0·3		...	44·5	45·3	−0·8
2400			50·9	50·6	+0·3		...	45·2	46·0	−0·8
2200			51·7	51·4	+0·3		...	46·2	46·7	−0·5
2000			52·4	52·2	+0·2		...	47·0	47·4	−0·4
1800			52·9	53·0	−0·1		...	47·5	48·0	−0·5
1600			53·4	53·8	−0·4		...	47·6	48·3	−0·7
1400			54·1	54·6	−0·5		...	48·2	48·7	−0·5
1200			54·8	55·7	+0·1		...	48·5	48·8	−0·3
1000			56·7	56·9	−0·2		...	48·9	48·9	0·0
800			59·5	58·2	+1·3		...	49·0	49·0	0·0
600			61·0	59·8	+1·2		...	49·0	49·0	0·0
400			62·5	62·0	+0·5		...	...	49·0	
200			...	64·4	...		...	The bal	loon th	en
ground.			...	67·1	...		...	turned	to asce	nd.

TABLE V. (*continued.*)

TWENTY-FIRST ASCENT (*continued*).

1864. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
June 27 (*con.*).			°	°	°			°	°	°
4000	From 8^h 54^m 30^s to 9^h 4^m p.m.	...	45·0	44·8	+0·2					
3800		...	46·3	45·2	+1·1					
3600		...	46·8	45·7	+1·1					
3400		...	46·7	46·2	+0·5					
3200		...	46·7	46·7	0·0					
3000		...	46·8	46·8	0·0					
2800		...	47·0	47·0	0·0					
2600		...	47·2	47·2	0·0					
2400		...	47·0	47·3	−0·3					
2200		...	46·8	47·4	−0·6					
2000		...	46·7	47·6	0·0					
1800		...	46·5	47·8	−0·3					
1600		...	47·3	48·0	−0·7					
1400		...	48·2	48·2	−0·9					
1200		...	48·6	48·4	+0·2					
1000		...	48·5	48·5	0·0					
800		...	48·5	48·5	0·0					
600		...	48·6	48·6	0·0					
400		...	48·4	48·4	0·0					
200										
ground.										

TWENTY-SECOND ASCENT.

1864. Height, in feet, above the mean level of the sea.	Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
August 29.										
5000	From 4^h 6^m 20^s p.m. to 4^h 17^m 30^s p.m.	Clear blue sky.	54·4	54·8	−0·4	From 5^h 18^m 40^s to 5^h 32^m p.m.	Clear blue sky.	49·0	50·1	−1·1
4800			54·4	55·4	−1·0			50·0	50·8	−0·8
4600			53·0	56·0	−3·0			50·8	51·5	−0·7
4400			54·5	56·7	−2·2			52·0	52·2	−0·2
4200			57·0	57·4	−0·4			52·5	52·9	−0·4
4000			57·5	58·1	−0·6			53·0	53·7	−0·7
3800			58·0	58·8	−0·8			54·0	54·4	−0·4
3600			59·5	59·5	0·0			55·1	55·1	0·0
3400			61·4	60·3	+1·1			55·4	55·9	−0·5
3200			62·4	61·1	+1·3			57·6	56·6	+1·0
3000			62·8	61·8	+1·0			58·5	57·4	+1·1
2800			63·1	62·5	+0·6			59·1	58·1	+1·0
2600			63·8	63·2	+0·6			59·8	58·8	+1·0
2400			65·0	64·2	+0·8			60·5	59·6	+0·9
2200			66·6	65·0	+1·6			61·2	60·3	+0·9
2000			67·4	65·8	+1·6			61·8	61·0	+0·8
1800			68·6	66·7	+1·9			62·5	61·7	+0·8
1600			69·9	67·6	+2·3			63·0	62·4	+0·6
1400			70·7	68·4	+2·3			64·9	63·2	+0·8
1200			71·0	69·2	+1·8			64·5	64·0	+0·5
1000			71·0	70·0	+1·0			65·5	65·0	+0·5
800			71·1	70·8	+0·3			66·0	65·8	+0·2
600			71·4	71·6	+0·8			66·6	66·6	0·0
400			72·1	72·5	−0·4			67·6	67·4	+0·2
200			72·4	73·4	−1·0			68·0	68·2	−0·2
ground.			72·5	74·3	−1·8			69·0	69·0	0·0

The numbers in the following Table differ very much from those in Table VI. in the Reports for the year 1862 and 1863; in these the largest numbers were those at the bottom of the column, and the smaller at higher elevations, and a decrease of temperature with elevation was shown without exception.

In the following Table there are instances of departure from both those indications, and other particulars which present all the above numbers to be combined with previous results.

In the first remarks on Table III. at page 266, the decrease of temperature as observed in the first 200 feet was no less than 8°; by the adopted curves passing nearly through the observed temperatures, it gives $2\frac{1}{4}$° decline in each 100 feet near the earth; these results seem doubtful; they differ so much from all others, that it seems likely that the readings were affected by the presence of many persons near the car of the balloon before starting, or that I have read the instruments wrongly by 5° before leaving the earth.

On January 12 (the only winter ascent in the series) the numbers are for the first time affected by the sign —, showing an increase of temperature with increase of elevation, and the numbers near the earth are smaller than those at higher elevations.

On April 6 the numbers are also anomalous as compared with those previously obtained; near the earth there was no change, and then a large change, and higher still some numbers are affected with the — sign.

On June 13, on descending at the time of sunset, it will be seen that there was scarcely any change of temperature for 1500 feet.

On June 20, on descending a little before sunset, the change was very small, and very different from corresponding changes on the ascent an hour before.

On June 27 there seemed scarcely any change in temperature up to 3000 feet, at readings taken after sunset, and till it was too dark to read the instruments.

The results on none of these days can be used in deducing general laws. The endeavour has been in the past year to take observations at times in the day and times in the year at which no observations had previously been made, resulting in these very different results.

The only days this year available for general combination are September 29, from observations made between 8^h a.m. and 10^h a.m., with a chiefly cloudy sky; and the numbers in column 28 show the mean values at the different elevations, and October 9 and August 29 for clear skies, and these results are shown in column 30.

The numbers in column 32 show the general mean from all the observations with cloudy skies, as based upon the number of experiments as shown in column 33 at each elevation, and these vary from 19 to 29.

The numbers in column 35 show the results for clear or nearly clear skies, as based on the number of experiments as shown in the column 36, varying in number from 8 to 12.

In column 34 the space in feet is shown for an increase of 1° with cloudy skies, varying from 167 feet near the earth to 334 at heights exceeding 3000 feet.

In column 37 the same results are shown for clear skies, being 143 feet near the earth, gradually increasing to 334 feet at heights exceeding 1600 feet.

TABLE VI.—Showing the Decrease of Temperature with every Increase of Height of 100 feet up to 5000 feet.

Height above the level of the sea. From	To	Aug. 31, 1863. In cloud at 1000 ft.; clear. Ascending.	Aug. 31, 1863. Cloudy below 3000 feet. Descend.	Aug. 31, 1863. Uniform mist. Descend.	Sept. 29, 1863. Cloudy. Ascending.	Sept. 29, 1863. Cloudy. Descending.	Oct. 9, 1863. Clear. Ascending.	Oct. 9, 1863. Clear. Descending.	Oct. 9, 1863. Clear. Ascending.	Jan. 12, 1864. Misty. Ascending.	Jan. 12, 1864. Misty. Descending.	Apr. 6, 1864. Cloudy. Ascending.	Apr. 6, 1864. Cloudy. Descending.	June 13, 1864. Clear. Ascending.	June 13, 1864. Clear. Descending.	June 13, 1864. Clear. Ascending.	June 13, 1864. Clear. Descending.	June 13, 1864. Clear. Ascending.	June 13, 1864. Clear. Descending.
feet.	feet.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
4900	5000	0·3	0·1	..	0·2	0·1	0·4	0·2	0·3	0·2	0·6	−0·1	−0·1	..	..	..	..	..	..
4800	4900	0·4	0·2	..	0·3	0·2	0·4	0·2	0·3	0·2	0·7	−0·1	−0·1	..	..	..	..	..	..
4700	4800	0·3	0·2	..	0·3	0·2	0·4	0·2	0·4	0·2	0·3	−0·4	−0·1	..	..	..	..	..	..
4600	4700	0·4	0·3	..	0·3	0·3	0·5	0·3	0·4	0·2	0·3	−0·4	−0·2	..	..	..	..	..	..
4500	4600	0·3	0·2	..	0·4	0·2	0·4	0·2	0·6	0·1	−0·2	−0·4	−0·1	..	..	..	..	..	..
4400	4500	0·2	0·3	..	0·3	0·3	0·3	0·3	0·6	0·2	−0·2	−0·4	−0·1	..	..	..	..	..	..
4300	4400	0·3	0·2	..	0·3	0·4	0·3	0·2	0·4	0·2	0·5	−0·6	0·0	..	..	..	..	..	..
4200	4300	0·3	0·3	..	0·3	0·4	0·3	0·3	0·3	0·3	0·5	−0·6	−0·1	..	..	..	..	..	..
4100	4200	0·3	0·2	..	0·3	0·4	0·3	0·2	0·3	0·2	0·3	0·0	−0·2	..	..	..	..	..	..
4000	4100	0·3	0·2	..	0·3	0·4	0·3	0·2	0·3	0·2	0·2	0·0	−0·2	..	..	..	..	..	..
3900	4000	0·3	0·2	..	0·3	0·3	0·3	0·3	0·3	1·5	0·3	0·0	−0·3	..	..	..	..	..	..
3800	3900	0·3	0·3	..	0·3	0·3	0·4	0·3	0·3	1·6	0·4	0·0	−0·3	..	..	..	..	..	..
3700	3800	0·3	0·2	..	0·3	0·3	0·4	0·2	0·3	0·5	0·4	0·0	−0·1	..	..	..	..	..	..
3600	3700	0·3	0·3	..	0·3	0·3	0·4	0·2	0·3	0·5	0·4	0·0	−0·1	..	..	..	..	..	..
3500	3600	0·3	0·2	..	0·3	0·3	0·3	0·2	0·3	0·3	0·4	0·2	0·0	..	..	..	..	..	..
3400	3500	0·3	0·3	..	0·3	0·4	0·4	0·3	0·2	0·2	0·3	0·3	0·0	..	..	..	..	..	..
3300	3400	0·3	0·2	..	0·3	0·4	0·3	0·2	0·3	0·6	0·4	0·0	−0·4	..	..	0·5	0·8	..	..
3200	3300	0·3	0·3	..	0·3	0·4	0·4	0·3	0·3	0·6	0·5	0·0	−0·5	..	..	0·5	0·9	..	..
3100	3200	0·3	0·2	..	0·3	0·4	0·3	..	0·3	0·3	0·4	0·0	−0·2	..	..	0·5	0·4	..	..
3000	3100	0·3	0·3	..	0·3	0·3	0·4	..	0·3	0·3	0·3	0·1	−0·2	..	..	0·6	0·5	..	..
2900	3000	0·3	0·3	..	0·3	0·3	0·3	..	0·3	−0·1	0·3	0·7	−0·2	0·4	0·1	0·7	0·7	0·2	0·1
2800	2900	0·3	0·3	..	0·3	0·3	0·4	..	0·3	−0·2	0·4	0·7	−0·3	0·4	0·1	0·7	0·7	0·3	0·2
2700	2800	0·3	0·2	..	0·3	0·4	0·3	..	0·3	−0·2	0·4	0·7	−0·2	0·2	0·3	0·5	0·1	0·2	0·2
2600	2700	0·3	0·3	..	0·3	0·3	0·4	..	0·3	−0·2	0·5	0·8	−0·1	0·2	0·4	0·5	0·1	0·3	0·3
2500	2600	0·3	0·2	..	0·3	0·4	0·3	..	0·3	−0·1	0·1	−0·2	0·0	0·3	0·4	0·5	..	..	0·2
2400	2500	0·3	0·3	..	0·4	0·4	0·4	..	0·1	0·0	0·0	−0·1	0·0	0·4	0·5	0·5	..	..	0·3
2300	2400	0·3	0·2	..	0·3	0·5	0·3	..	0·2	0·0	0·1	0·4	0·0	0·1	..	..	..	..	0·2
2200	2300	0·3	0·3	..	0·3	0·5	0·4	..	0·2	−0·1	0·2	0·4	0·1	0·1	..	..	..	..	0·3
2100	2200	0·3	0·3	..	0·3	0·6	0·4	..	0·2	−0·1	0·1	0·3	0·0	0·4	..	..	..	..	0·4
2000	2100	0·4	0·3	..	0·3	0·5	0·4	..	0·3	−0·1	0·2	0·2	0·1	0·5	..	..	..	..	0·5
1900	2000	0·3	0·3	0·1	0·3	0·5	0·4	..	0·2	−0·4	0·1	0·4	0·2	0·3	..	..	..	..	0·4
1800	1900	0·4	0·3	0·1	0·3	0·5	0·4	..	0·3	−0·4	0·0	0·4	0·2	0·4	..	..	..	..	0·5
1700	1800	0·3	0·3	0·0	0·3	0·5	0·4	..	0·2	−0·9	0·1	0·6	0·1	0·4	..	..	..	..	0·3
1600	1700	0·3	0·3	0·1	0·4	0·5	0·4	..	0·3	−0·9	0·1	0·6	0·0	0·5	..	..	..	..	0·3
1500	1600	0·3	0·3	0·1	0·3	0·6	0·4	..	0·2	−0·3	..	0·6	0·2	0·5	..	..	..	..	0·2
1400	1500	0·4	0·3	0·1	0·3	0·6	0·4	..	0·3	−0·3	..	0·7	0·2	0·5	..	..	..	..	0·1
1300	1400	0·3	0·3	0·2	0·3	0·5	0·4	..	..	−0·8	..	0·2	0·2	0·3	..	..	..	..	0·0
1200	1300	0·3	0·4	0·2	0·4	0·5	0·5	..	..	−0·8	..	0·1	0·2	0·4	..	..	..	..	0·1
1100	1200	0·3	0·3	0·2	0·3	0·4	0·4	..	..	0·1	..	0·3	0·4	0·3	..	..	..	..	0·0
1000	1100	0·4	0·3	0·2	0·3	0·4	0·5	..	..	0·1	..	0·3	0·5	0·4	..	..	..	..	0·1
900	1000	0·4	..	0·2	0·3	·4	0·4	..	..	0·2	..	0·3	0·4	0·2	..	..	..	..	0·0
800	900	0·5	..	0·3	0·3	·4	0·5	..	..	0·2	..	0·4	0·3	0·2	..	..	..	..	0·0
700	800	0·5	..	0·2	0·3	·4	0·4	..	..	0·1	..	0·9	0·4	0·2	..	..	..	..	0·0
600	700	0·6	..	0·3	0·3	0·4	0·5	..	..	0·1	..	0·9	0·4	0·3	..	..	..	..	0·0
500	600	0·7	..	0·2	0·4	0·5	0·4	..	..	0·5	..	0·5	1·0	0·2	..	..	..	..	0·0
400	500	0·8	..	0·3	0·4	0·6	0·5	..	..	0·5	..	0·5	1·0	0·2	..	..	..	..	0·0
300	400	1·1	..	0·2	0·3	0·6	0·4	..	..	0·2	..	0·1	0·2	0·3	..	..	..	..	0·0
200	300	1·1	..	0·2	0·4	0·6	0·5	..	..	0·2	..	0·2	0·1	0·4	..	..	..	..	0·0
100	200	2·2	..	0·2	0·3	0·6	0·4	..	..	0·2	..	0·0	0·1	0·5	..	..	..	..	0·0
0	100	2·2	..	0·3	0·4	0·6	0·5	..	..	0·2	..	0·0	0·2	0·5	..	..	..	..	0·0
No. of col.		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.

From	To	June 20, 1864. Cloudy. Ascending.	June 20, 1864. Cloudy. Descending.	June 20, 1864. Cloudy. Ascending.	June 20, 1864. Cloudy. Descending.	June 27, 1864. Partially clear. Ascending.	June 27, 1864. Partially clear. Descending.	June 27, 1864. Partially clear. Ascending.	Aug. 29, 1864. Clear. Ascending.	Aug. 29, 1864. Clear. Descending.	Mean. Cloudy.	Mean. No. of experiments.	Mean. Clear.	Mean. No. of experiments.	General mean (omitting July 17, 1862, August 31, 1863, January 12, April 6, June 13, 20, and 27, 1864.) Cloudy. Mean.	Cloudy. Number of experiments.	Cloudy. Space passed through for a decline of 1°.	Clear. Mean.	Clear. Number of experiments.	Clear. Space passed through for a decline of 1°.
feet.	feet.	°	°	°	°	°	°	°	°	°	°		°		°		feet.	°		feet.
4900	5000	..	..	..	..	0·1	0·1	..	0·2	0·3	0·1	2	0·3	5	0·3	20	334	0·3	10	334
4800	4900	..	..	..	..	0·1	0·1	..	0·3	0·4	0·2	2	0·3	5	0·3	20	334	0·3	10	334
4700	4800	..	..	..	..	0·1	0·1	..	0·3	0·3	0·2	2	0·3	5	0·3	19	334	0·3	10	334
4600	4700	..	..	..	..	0·2	0·2	..	0·3	0·4	0·3	2	0·4	5	0·3	19	334	0·3	10	334
4500	4600	..	..	..	..	0·2	0·0	..	0·3	0·3	0·3	2	0·4	5	0·3	20	334	0·3	10	334
4400	4500	..	..	..	..	0·3	0·0	..	0·4	0·4	0·3	2	0·4	5	0·3	20	334	0·3	10	334
4300	4400	..	..	..	..	0·1	0·0	..	0·3	0·3	0·3	2	0·3	5	0·3	23	334	0·3	10	334
4200	4300	..	..	..	..	0·2	0·1	..	0·4	0·4	0·3	2	0·3	5	0·3	23	334	0·3	10	334
4100	4200	..	..	0·5	0·3	0·3	0·1	..	0·3	0·4	0·3	2	0·3	5	0·3	23	334	0·3	12	334
4000	4100	..	..	0·6	0·3	0·4	0·2	..	0·4	0·4	0·3	2	0·3	5	0·3	24	334	0·3	12	334
3900	4000	0·2	0·0	0·4	0·4	0·5	0·2	0·2	0·3	0·3	0·3	2	0·3	5	0·3	24	334	0·3	12	334
3800	3900	0·3	−0·1	0·5	0·4	0·5	0·2	0·2	0·4	0·4	0·3	2	0·3	5	0·3	24	334	0·3	12	334
3700	3800	0·2	0·0	0·3	0·4	0·5	0·2	0·2	0·3	0·3	0·3	2	0·3	5	0·3	25	334	0·3	11	334
3600	3700	0·3	0·0	0·3	0·4	0·5	0·3	0·3	0·4	0·4	0·3	2	0·3	5	0·3	25	334	0·3	11	334
3500	3600	0·4	0·1	0·3	0·4	0·4	0·2	0·2	0·4	0·4	0·3	2	0·3	5	0·3	25	334	0·3	11	334
3400	3500	0·4	0·1	0·3	0·4	0·5	0·3	0·3	0·4	0·4	0·3	2	0·3	5	0·3	25	334	0·3	11	334
3300	3400	0·2	0·2	0·2	0·4	0·4	0·2	0·2	0·4	0·3	0·3	2	0·3	5	0·3	25	334	0·3	11	334
3200	3300	0·1	0·3	0·2	0·5	0·4	0·3	0·3	0·4	0·4	0·3	2	0·3	5	0·3	25	334	0·3	11	334
3100	3200	0·2	0·4	0·1	0·5	0·4	0·2	0·0	0·3	0·4	0·3	2	0·3	4	0·3	26	334	0·3	10	334
3000	3100	0·3	0·4	0·2	0·5	0·4	0·3	0·1	0·4	0·4	0·3	2	0·3	4	0·4	25	251	0·3	10	334
2900	3000	0·3	0·3	0·0	0·5	0·4	0·3	0·1	0·3	0·3	0·3	2	0·3	4	0·4	26	251	0·3	10	334
2800	2900	0·4	0·4	0·1	0·5	0·4	0·3	0·1	0·4	0·4	0·3	2	0·3	4	0·4	26	251	0·3	10	334
2700	2800	0·4	..	..	0·5	0·4	0·3	0·1	0·4	0·3	0·3	2	0·3	4	0·4	27	251	0·3	10	334
2600	2700	0·4	..	..	0·6	0·4	0·4	0·1	0·4	0·4	0·3	2	0·4	4	0·4	27	251	0·3	10	334
2500	2600	0·5	..	..	0·5	0·4	0·3	0·0	0·4	0·4	0·3	2	0·4	4	0·4	28	251	0·3	10	334
2400	2500	0·6	..	..	0·6	0·4	0·4	0·1	0·5	0·4	0·4	2	0·4	4	0·4	28	251	0·3	10	334
2300	2400	0·4	..	..	0·5	0·4	0·3	0·0	0·4	0·3	0·4	2	0·3	4	0·4	27	251	0·3	10	334
2200	2300	0·4	..	..	0·5	0·4	0·4	0·1	0·4	0·4	0·4	2	0·4	4	0·4	27	251	0·3	10	334
2100	2200	0·3	..	..	0·5	0·4	0·3	0·1	0·4	0·3	0·4	2	0·3	4	0·4	27	251	0·3	10	334
2000	2100	0·4	..	..	0·6	0·4	0·4	0·1	0·4	0·4	0·4	2	0·4	4	0·4	27	251	0·3	10	334
1900	2000	0·3	..	..	0·4	0·4	0·3	0·1	0·4	0·3	0·4	2	0·3	4	0·4	27	251	0·3	10	334
1800	1900	0·3	..	..	0·4	0·4	0·3	0·1	0·5	0·4	0·4	2	0·4	4	0·4	27	251	0·3	10	334
1700	1800	0·4	..	..	0·3	0·4	0·1	0·1	0·4	0·3	0·4	2	0·3	4	0·4	29	251	0·3	10	334
1600	1700	0·4	..	..	0·3	0·4	0·2	0·1	0·5	0·4	0·4	2	0·4	4	0·4	29	251	0·3	10	334
1500	1600	0·4	..	..	0·2	0·4	0·2	0·1	0·4	0·4	0·4	2	0·4	4	0·4	31	251	0·4	11	251
1400	1500	0·5	..	..	0·3	0·4	0·2	0·1	0·4	0·4	0·4	2	0·4	4	0·4	31	251	0·4	11	251
1300	1400	0·5	..	..	0·2	0·5	0·0	0·1	0·4	0·4	0·4	2	0·4	3	0·4	28	251	0·4	8	251
1200	1300	0·6	..	..	0·3	0·6	0·1	0·1	0·4	0·5	0·4	2	0·4	3	0·4	28	251	0·5	8	201
1100	1200	0·4	..	..	0·3	0·6	0·0	0·0	0·4	0·4	0·4	2	0·4	3	0·4	28	251	0·5	8	201
1000	1100	0·5	..	..	0·3	0·6	0·1	0·1	0·4	0·5	0·4	2	0·4	3	0·4	28	251	0·5	8	201
900	1000	0·4	..	..	0·1	0·6	0·0	0·0	0·4	0·4	0·4	2	0·4	3	0·4	24	251	0·5	8	201
800	900	0·4	..	..	0·1	0·7	0·1	0·0	0·4	0·4	0·4	2	0·4	3	0·4	22	251	0·5	8	201
700	800	0·4	..	..	0·2	0·8	0·0	0·0	0·4	0·4	0·4	2	0·4	3	0·4	22	251	0·5	8	201
600	700	0·4	..	..	0·3	0·8	0·0	0·1	0·4	0·4	0·4	2	0·4	3	0·4	22	251	0·5	8	201
500	600	0·4	..	..	0·3	1·1	0·0	0·1	0·4	0·4	0·4	2	0·4	3	0·5	20	201	0·5	8	201
400	500	0·5	..	..	0·3	1·1	0·0	0·1	0·5	0·4	0·5	2	0·4	3	0·5	20	201	0·5	8	201
300	400	0·4	..	..	0·2	1·2	..	..	0·4	0·4	0·5	2	0·4	3	0·5	20	201	0·5	8	201
200	300	0·5	..	..	0·2	1·2	..	..	0·5	0·4	0·5	2	0·4	3	0·5	20	201	0·6	8	167
100	200	0·4	..	..	0·1	1·3	..	..	0·5	0·4	0·5	2	0·4	3	0·5	20	201	0·6	8	167
0	100	0·4	..	..	0·1	1·4	..	..	0·5	0·4	0·5	2	0·5	3	0·6	20	167	0·7	8	143
No. of col.		19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37

§ 6. Variation of the Hygrometric Condition of the Air with Elevation.

All the adopted readings of the temperature of the dew-point in Section 4 were laid down on diagrams, and joined by lines drawn from one to the other. In the case of the temperature of the air, when thus joined, a curved line can be drawn through them, giving equal weight to every observation, but this cannot be done with respect to the temperature of the dew-point, it being far more variable than the temperature of the air, and the numbers in the following Table are those as read at every 1000 feet from the diagram formed simply by joining the point of observation.

Table VII.—Showing the Variation of the Hygrometric condition of the Air at every 1000 feet of Height.

Fourteenth Ascent.

1863. Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
August 31.			°	in.				°	in.	
8000	From $6^h\ 7^m$ p.m. to $6^h\ 29^m\ 30^s$ p.m.	Sun shining.	18·8	·102	52	From $6^h\ 29^m\ 30^s$ p.m. to $6^h\ 52^m$ p.m.		24·5	·132	53
7000		Very dark cloud near us.	19·1	·103	51			27·3	·149	65
6000			28·6	·157	66			30·3	·169	73
5000			32·2	·182	66		In basin of clouds.	31·5	·177	75
4000		Very cold.	36·7	·218	72			33·9	·195	74
3000			41·5	·262	79			42·1	·268	97
2000		Above cloud.	47·5	·329	88		Just in clouds.	45·0	·299	95
1000			52·7	·399	93			47·4	·328	94
ground		Getting into cloud.	56·7	·461	77		Stratum of clouds above.			
2000	From $6^h\ 52^m$ p.m. to $6^h\ 55^m$ p.m.	In clouds.	47·2	·325	90	From $6^h\ 55^m$ p.m. to $6^h\ 58^m$ p.m.	In uniform mist.	46·0	·311	85
1000			48·5	·342	91			49·1	·349	93
ground										

August 31.—The temperature of the dew-point on the ground before starting was 56°·7, or 7°·3 below that of the air; at 1100 feet these two temperatures were both 54°, the air being saturated with moisture; at 1150 feet the air suddenly became drier, the difference between the temperatures of the air and dew-point was 5°; at 7100 feet the temperatures of the air and dew-point were 34° and 18° respectively, and remained at these values nearly, while the balloon ascended to more than 8000 feet and descended to 7900 feet. The difference between the temperatures of the air and dew-point after this was generally less and less to 3000 feet, at which clouds were entered, and the air was nearly saturated with moisture; at 1000 feet high the temperature of the air was 49°, and that of the dew-point 47°·4.

The balloon then reascended, and on again entering cloud at 1580 feet, the air was again saturated with moisture, and on descending, it was nearly saturated at 1200 feet and at 820 feet; at the latter height the respective temperatures were 53° and 52°.

Table VII. (*continued.*)

Fifteenth Ascent.

1863. Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
September 29.			°	in.				°	in.	
16000	From $7^h\ 42^m$ a.m. to $9^h\ 31^m\ 30^s$ a.m.					From $9^h\ 33^m\ 30^s$ a.m. to $10^h\ 19^m$ a.m.				
15000		Sun shining.	−10·0	·026	54					
14000			+ 0·5	·045	68					
13000			10·1	·068	81		...	1·3	·046	54
12000		No sun.	2·7	·049	58		...	2·2	·048	51
11000			− 8·6	·029	31		...	− 3·8	·036	33
10000			− 2·0	·040	36		...	−10·2	·026	21
9000		Dense clouds above us.	+15·5	·088	71		...	− 5·5	·033	25
8000			13·7	·081	53		...	2·8	·049	32
7000			19·5	·105	66		Sun warm.	14·8	·085	48
6000		Clouds above and below.	24·4	·131	72			20·8	·112	59
5000			28·5	·156	75		...	23·8	·128	56
4000			32·4	·184	81		...	24·5	·132	56
3000		Sun faint.	38·5	·233	87		...	23·6	·127	49
2000			40·7	·254	86		...	26·8	·146	45
1000		Misty all round.	42·6	·273	89					
ground			44·1	·289	86					

September 29.—The temperature of the dew-point decreased from 44° on the ground, or 490 feet above the sea, to 42½° at 1000 feet above the sea, where mist was prevalent, and the degree of humidity increased from 86 to 89.

On passing out of the mist at 3000 feet the humidity declined from 87 to 58 at 8000 feet; here there were dense clouds both above and below; at 9000 feet the degree of humidity was 71.

There were faint gleams of the sun at 10,000 feet, and the difference between the temperature of the air and dew-point was 22½°, the degree of humidity being 36, showing a decrease of no less than 35 in a difference of 1000 feet of elevation; at 11,000 feet it was drier still, the temperatures of the air and dew-point being 16°·9 and −8°·6 respectively, or a difference of 25°·5, and the degree of humidity 31; at 13,000 feet the difference had decreased to 4°·4 and the humidity increased to 81; at 15,000 feet it was 12°·0, and the humidity had decreased to 54; the balloon continued to ascend, but the humidity is unknown above the last-mentioned height, till on descending to 13,000 feet it was 54, and the difference between the temperatures of the air and dew-point was 13°·9; at 10,000 feet the air again became very dry, the two temperatures being 22°·9 and −10°·2 respectively, showing a difference of 33°·1 and a humidity of 21; the air then gradually became less dry till 5000 feet, when the difference was 11°·9 and the humidity 56; after this the difference increased in a small amount, and then decreased to 20°·2 at 2000 feet, where the humidity was 45.

TABLE VII. (*continued.*)

SIXTEENTH ASCENT.

1863. Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
October 9.			°	in.				°	in.	
7000	From 4^h 27^m p.m. to 4^h 43^m 30^s p.m.		19·8	·107	61	From 4^h 48^m p.m. to 5^h 1^m 30^s p.m.	...	18·3	·099	58
6000			22·1	·118	66		...	20·5	·110	61
5000			26·0	·141	69		...	23·4	·125	65
4000		Mist over land.	31·0	·174	71		...	26·2	·142	68
3000			34·3	·198	74		...	31·1	·174	71
2000			37·6	·225	70					
1000			40·5	·252	70					
ground			44·1	·289	68					
3000	...	...	32·2	·182	71	From 5^h 2^m p.m. to 5^h 8^m p.m.	...	33·0	·188	74
2000	...	...	...	...	...		A thin mist.	39·0	·238	84
8000	From 5^h 9^m p.m. to 5^h 55^m 45^s p.m.		9·7	·067	43	...	...	Too dark to observe.		
7000			12·8	·077	46	...	...			
6000			19·0	·103	56	...	...			
5000			27·6	·151	72	...	...			
4000		A sudden dryness.	31·1	·174	76	...	...			
3000			35·0	·204	76	...	...			
2000			41·1	·258	87	...	...			

October 9.—The difference between the temperatures of the air and dew-point on the ground was 10½°, their respective readings being 54½° and 44°; and this difference varied but little till 7310 feet was reached, at which height the temperatures were 30° and 18° respectively. On descending to 2330 feet the temperature of the air was 42°, and that of the dew-point 35½°, the difference being 6½°. On reascending the difference was found to be rather larger, but on descending again it decreased to 6½° at 2270 feet, where mist was prevalent, and it decreased to 2°·7 at 1500 feet, the two temperatures being 44°·8 and 42°·1 respectively. On ascending to 3300 feet, the air became suddenly drier, continued of the same degree of humidity to 4000 feet, above which there was less and less humidity with increase of elevation till the height of 8000 feet was reached, when it became too dark to read the instruments.

TABLE VII. (*continued.*)

SEVENTEENTH ASCENT.

1864. Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
January 12.			°	in.				°	in.	
11000	From 2^h 8^m p.m. to 3^h 25^m p.m.	Fine snow.	− 0·9	·042	51	From 3^h 36^m p.m. to 4^h 3^m 15^s p.m.	Snow fine and thin.	2·4	·049	61
10000			4·8	·053	52			14·5	·084	91
9000		Misty.	2·5	·049	38		Clouds above and below.	17·4	·095	88
8000			9·5	·066	43			20·0	·108	88
7000		Colder current.	15·2	·086	50		Near clouds.	23·0	·123	92
6000			28·3	·155	83		Very misty.	25·9	·140	87
5000			28·5	·156	70			28·5	·156	93
4000			27·6	·151	65			30·1	·168	89
3000			36·5	·216	73			34·4	·199	91
2000		Calm and warm to sense.	39·5	·242	85			38·0	·229	96
1000		Sensibly warm.	35·7	·209	84					
ground.			35·9	·211	80					

January 12.—The temperature of the dew-point on leaving the earth was 36°, that of the air 41½°, the degree of humidity was 80. The air gradually became more moist on ascending till 1300 feet was reached, when the difference between the two temperatures was 3°·1; a warm current was then met with, but the difference between the two temperatures did not vary much till 2200 feet was passed, then it increased to 10½° at 4000 feet; the air again became moist, and at 6000 feet the difference of temperature amounted to only 4½°, with 83 as the degree of humidity. The depression of the wet thermometer below the dry greatly increased, till at 9300 feet it was 20°·7, the degree of humidity being 38; and at 9800 feet cloud was entered; the difference decreased to 12°·2, and the degree of humidity increased to 56; the air then became drier, and at 11,900 feet (the highest point) the difference was 23°·7, and the degree of humidity 42. On descending the air gradually became moist, till at 8600 feet it was nearly saturated, then became somewhat drier, but was again nearly saturated at 5000 feet, the degree of humidity being 93; again it became drier, but at 2000 feet the air was within 1° of saturation, after which it became slightly drier till the ground was reached.

TABLE VII. (*continued.*)

EIGHTEENTH ASCENT.

1864. Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
April 6.			°	in.				°	in.	
11000	From 4^h 9^m 10^s p.m. to 4^h 37^m p.m.		15·2	·086	39	From 4^h 37^m p.m. to 5^h 7^m p.m.		16·5	·092	39
10000			15·0	·086	42			22·5	·120	41
9000		Sun warm.	20·9	·112	56		Very warm.	24·4	·131	42
8000			25·5	·138	58			26·8	·146	47
7000			34·4	·199	85			29·8	·166	53
6000		Blue sky	31·4	·176	84		Entered cloud.	31·0	·174	64
5000			28·8	·158	74			32·1	·182	66
4000			31·0	·174	87			32·5	·184	69
3000		Fog wetting.	31·5	·177	91			32·0	·181	74
2000		Entering cloud, misty.	33·7	·193	85			33·3	·190	78
1000			34·2	·197	75			35·2	·205	78
ground.		Very misty.	38·5	·233	76			36·8	·218	61
NINETEENTH ASCENT.										
June 13.										
3000	From 7^h p.m. to 7^h 8^m p.m.		38·6	·234	64			38·6	·234	64
2000			39·0	·238	56					
1000			42·4	·271	55					
ground.			44·7	·296	54					
3000			38·3	·023	69	From 7^h 52^m p.m. to 8^h 14^m p.m.		37·5	·225	63
3000			41·1	·258	70			36·5	·216	62
2000								43·4	·281	73
1000								46·5	·317	75
ground.								46·1	·312	74

April 6.—The temperature of the dew-point on leaving the earth was 38°·5, and the degree of humidity 76, the difference between the temperature of the air and that of the dew-point being 7°.

This difference remained nearly stationary till about 1400 feet, where mist was prevalent; the balloon entered cloud at 2100 feet, and by the time 2470 feet was reached the difference had declined to 2°. The air then became rather drier, but by the time 3500 feet was attained, the difference only equalled 1°, after which the air became several times moist and dry; at 6900 feet the difference was 3°, then it suddenly became drier, and continued to get so till 9400 feet, when it amounted to 19½°, and continued about the same till 11,000 feet (the highest point), where it equalled 21°. On descending the air gradually became moist, and continued so till within 1400 feet of the earth, the difference being at that height 5°, after which it began to increase, and continued to do so, till on the ground it amounted to 9°, these respective values being 45°·8 and 36°·8.

June 13.—The temperature of the dew-point was 44½° on the ground

before starting, the difference between that and the temperature of the air being 17°, which nearly gradually declined to 13° by the time 3000 feet was gained. On descending the temperature was found to be nearly the same at 2300 feet as it was at 3000 feet; the difference at the lower of these elevations was 14°; on reascending the difference decreased till 3450 feet was gained, then increased to 13° by 3540 feet; on descending it remained nearly the same; on again ascending it differed very little also till 3050 feet was reached, where it was also 13°; the balloon then turned to make our downward journey, when the difference decreased to 9° and to 8° by the time the ground was reached.

TABLE VII. (*continued.*)

TWENTIETH ASCENT.

1864. Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-poin t.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
June 20.			°	in.				°	in.	
4000	From 6^h 17^m p.m. to 6^h 27^m 15^s p.m.		48·0	·335	85	From 6^h 31^m p.m. to 6^h 35^m p.m.		47·7	·331	88
3000			48·0	·335	80			47·0	·323	80
2000			50·0	·366	76					
1000			51·1	·375	66					
ground			55·8	·446	68					
4000	From 6^h 41^m p.m. to 6^h 48^m p.m.		48·6	·343	93	From 6^h 48^m p.m. to 7^h 16^m p.m.		46·9	·332	89
3000			49·2	·351	84			50·4	·366	87
2000								51·1	·375	69
1000								54·0	·418	75
ground								54·0	·418	68

June 20.—The temperature of the dew-point was 55°·8 on the ground, the difference between that and the temperature of the air being 10°·7, declining very gradually till 4100 feet was gained, where the difference was 3½°; on descending it gradually increased to 2740 feet, it then being 4°; on reascending the air again began to get moist, although at several points it seemed inclined to get drier, but then went back to its moist state again; at 4270 feet, however, complete saturation was met with; on descending it became drier in the first 100 feet, remained about the same for 800 feet, then became moist at 3200 feet; became drier at 2700 feet, after which, with one slight exception, it remained the same till the ground was reached, the difference then being 10½°.

June 27.—The temperature of the dew-point was 46½° on the ground, differed but little from 43° from 500 feet to 1500 feet high, was about 40½° at 3000 feet, and 38° at 4000 feet; at about 4100 feet the air was more moist, the difference between the temperatures of the air and dew-point being 2½°; this difference increased till at 5000feet it was rather less than 4°, the humidity being 86°. On descending the air became gradually drier, till at nearly 4500 feet the difference was 6°·2; the air then again became moist, for at 3600 feet it was 2½°, the air then began to get drier; continuing to do so till at 660 feet it was 10½°; on reascending this difference very gradually increased till about 3650 feet, when it was 13°; on reaching 3240 feet it had

TABLE VII. (*continued.*)

TWENTY-FIRST ASCENT.

1864. Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
			°	in.				°	in.	
June 27.	From $6^h 33^m 30^s$ p.m. to $7^h 41^m$ p.m.					From $7^h 41^m$ p.m. to $8^h 52^m$ p.m.		38·5	·233	87
5000			38·5	·233	86			35·3	·206	78
4000			38·2	·231	81			38·3	·231	84
3000			40·5	·252	71			40·5	·232	78
2000			40·2	·249	63			38·3	·231	67
1000			44·5	·294	64					
0										
4000	From $8^h 54^m 30^s$ p.m. to $9^h 4^m$ p.m.		35·6	·208	70					
3000			36·7	·218	68					
2000			35·4	·207	65					
1000			37·0	·220	64					
0										
TWENTY-SECOND ASCENT.										
August 29.	From $4^h 6^m 20^s$ p.m. to $4^h 49^m 30^s$ p.m.	Clear blue sky.				From $4^h 49^m 30^s$ p.m. to $5^h 32^m$ p.m.	Clear blue sky.	− 2·2	·040	25
14000			22·5	·120	59			− 2·3	·040	24
13000			10·8	·070	37			6·2	·057	32
12000			13·9	·081	40			12·8	·077	41
11000			25·0	·135	56			19·5	·105	54
10000			29·6	·164	64			31·7	·179	79
9000			28·8	·158	58			20·1	·108	42
8000			28·2	·154	46			21·0	·113	38
7000			37·5	·225	60			37·2	·222	79
6000			41·0	·257	60			42·3	·270	78
5000			43·5	·283	67			44·8	·297	74
4000			37·0	·220	47			51·9	·386	79
3000			41·9	·266	47			45·4	·304	55
2000			45·4	·304	45			47·6	·330	53
1000			46·4	·316	42			47·9	·334	47
ground.			45·4	·304	38					

decreased to 8°, but on attaining 3520 feet it was 11½°, and at 4000 feet the temperatures of the air and dew-point were 45° and 35½° respectively, showing a difference of 9½°, and a humidity of 70°.

August 29.—The differences between the temperatures of the air and those of the dew-point in this ascent were rather remarkable; on starting it was very large, viz. 27°, their respective readings being 72½° and 45½°, and the degree of humidity 38. The difference decreased very gradually till 4500 feet was gained, when the air became suddenly moist, the difference only amounting to 6½° at 5600 feet, then became dry, and continued so till 11,000 feet was reached, the humidity being 56; after which it increased in dryness till the difference equalled 23° at 13,000 feet, the humidity having decreased to 37; it was moderately moist at the highest point, the difference there being 9°.

On descending, at 14,000 feet the air became very suddenly dry, the difference between the two temperatures increasing from 9° to 32° in a minute and a half, and the humidity being 25; it then declined to 6° at 9100 feet, increased again to 23° at 7350 feet; decreased to 6½° by 4550 feet, after which it increased to 21° on the ground, where the degree of humidity was 47.

TABLE VIII.—Showing the Degree of Humidity at every 1000 feet.

Height above the level of the sea.	August 31, 1863.				Sept. 29, 1863.		October 9, 1864.					Jan. 12, 1864.		April 6, 1864.		June 13, 1864.						June 20, 1864.				June 27, 1864.			Aug. 29, 1864.		Mean.			
State of the Sky.	In cloud at 1000 ft., clear above.	Cloudy below 3000 ft.	Uniform mist.		Cloudy.		Clear.					Misty.		Cloudy.		Clear.						Cloudy.				Partially clear.			Clear.					
	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Ascending.	Descending.	Cloudy.	Number of experiments.	Clear.	Number of experiments.
feet.																																		
15000	...	...	...	...	54	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	54	1		
14000	...	...	...	...	68	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	59	25	68	1	42	2
13000	...	...	...	...	81	54	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	37	24	68	2	32	2
12000	...	...	...	...	38	51	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	40	32	45	2	36	2
11000	...	...	...	...	31	33	...	...	...	...	...	51	61	39	39	...	...	...	...	...	...	...	...	...	...	...	...	...	56	41	43	6	48	2
10000	...	...	...	...	36	21	...	...	...	...	...	52	91	42	41	...	...	...	...	...	...	...	...	...	...	...	...	...	64	54	47	6	59	2
9000	...	...	...	...	71	25	...	...	...	...	...	38	88	56	42	...	...	...	...	...	...	...	...	...	...	...	...	...	58	79	54	6	68	2
8000	52	53	...	...	53	32	...	...	...	...	43	43	88	58	47	...	...	...	...	...	...	...	...	...	...	...	...	...	46	42	54	6	47	5
7000	51	65	...	...	66	48	61	58	...	...	46	50	92	85	53	...	...	...	...	...	...	...	...	...	...	...	...	...	60	38	66	6	56	7
6000	66	73	...	...	72	59	66	61	...	...	56	83	87	84	64	...	...	...	...	...	...	...	...	...	...	...	...	...	60	79	75	6	66	7
5000	66	75	...	...	75	56	69	65	...	...	72	70	93	74	66	...	...	...	...	...	...	...	...	...	...	86	87	...	67	78	73	6	74	9
4000	72	74	...	...	81	56	71	68	...	...	76	65	89	53	69	...	...	...	...	...	...	85	88	93	89	81	78	70	47	74	77	10	71	10
3000	79	97	...	...	87	49	74	71	71	74	76	73	91	91	74	64	64	69	63	70	62	80	80	84	87	71	84	68	47	79	81	11	70	17
2000	88	95	90	85	86	45	70	...	...	84	87	85	96	85	78	56	...	...	...	...	73	76	...	...	69	63	78	65	45	55	83	11	70	11
1000	93	94	91	93	89	...	70	...	...	...	...	84	...	75	78	55	...	...	...	...	75	66	...	...	75	64	67	64	42	53	84	10	61	8
0	77	...	...	...	86	...	68	...	...	...	...	80	...	76	61	54	...	...	...	...	73	68	...	...	68	...	...	...	38	47	73	7	56	5
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.

The numbers in this Table show, as in all the previous experiments, that the moisture of the air at the same elevation is very different at different times; and that on the same day the moisture is very differently distributed, there having been on some of the days of experiments several successive wet and dry strata placed one above the other.

The numbers in the last columns show the average results at the different elevations, in the two states of cloudy and clear skies, and the number of experiments upon which each result is based.

By combining those with a cloudy sky with those previously obtained, according to the number of observations upon which each value was based, the following results were obtained:—

With an overcast sky, the degree of humidity on the earth was........	74	from	19	experiments.
At 1000 feet	76	,,	33	,,
2000 ,, ...	76	,,	34	,,
3000 ,, ...	78	,,	35	,,
4000 ,, ...	75	,,	27	,,
5000 ,, ...	74	,,	16	,,
6000 ,, ...	73	,,	14	,,
7000 ,, ...	62	,,	11	,,
8000 ,, ...	54	,,	11	,,
9000 ,, ...	50	,,	11	,,
10,000 ,, ...	48	,,	10	,,
11,000 ,, ...	47	,,	10	,,
12,000 ,, ...	52	,,	6	,,
13,000 ,, ...	58	,,	6	,,
14,000 ,, ...	52	,,	5	,,
15,000 ,, ...	59	,,	3	,,
16,000 ,, ...	59	,,	2	,,
17,000 ,, ...	47	,,	2	,,
18,000 ,, ...	33	,,	2	,,
19,000 ,, ...	24	,,	2	,,
20,000 ,, ...	29	,,	2	,,
21,000 ,, ...	22	,,	2	,,
22,000 ,, ...	34	,,	1	,,
23,000 ,, ...	40	,,	1	,,

The law of moisture here shown is a slight increase from the earth to the height of 3000 feet, and then a slight decrease to 6000 feet, the degree of humidity being at this elevation nearly of the same value as on the ground. From 6000 to 7000 feet there is a large decrease, and then an almost uniform decrease to 11,000 feet; it increases from 12,000 to 16,000 feet, and then decreases. The number of experiments up to 11,000 feet vary from 10 to 35, and I think great confidence may be placed in the results to this elevation; but at heights from 12,000 feet the number of experiments are evidently too small to speak with any confidence in respect to the results.

By treating the results with a clear or a nearly clear sky in the same way, the following results were obtained.

With a clear sky, the degree of humidity was—

On the ground	59	from	9	experiments.
At 1000 feet	61	,,	14	,,
2000 ,, ...	70	,,	17	,,
3000 ,, ...	71	,,	23	,,
4000 ,, ...	71	,,	19	,,
5000 ,, ...	69	,,	17	,,
6000 ,, ...	62	,,	15	,,
7000 ,, ...	56	,,	16	,,
8000 ,, ...	50	,,	14	,,
9000 ,, ...	50	,,	9	,,
10,000 ,, ...	46	,,	18	,,
11,000 ,, ...	43	,,	10	,,
12,000 ,, ...	35	,,	8	,,
13,000 ,, ...	37	,,	7	,,
14,000 ,, ...	37	,,	7	,,
15,000 ,, ...	44	,,	5	,,
16,000 ,, ...	40	,,	5	,,
17,000 ,, ...	39	,,	4	,,
18,000 ,, ...	21	,,	2	,,
19,000 ,, ...	36	,,	2	,,
20,000 ,, ...	33	,,	1	,,
21,000 ,, ...	32	,,	1	,,
22,000 ,, ...	21	,,	1	,,
23,000 ,, ...	16	,,	1	,,

The law of moisture here shown is a slight increase to 1000 feet, a considerable increase between 1000 and 2000 feet, a nearly constant degree of humidity from 2000 to 5000 feet, and a gradual decrease afterwards to 12,000 feet; at greater heights the numbers are less regular. The results up to 11,000 feet are based upon experiments varying from 10 to 23, and are most likely very nearly true normal values; at heights exceeding 12,000 feet the number of experiments have varied from 1 to 8, and no great confidence can be placed in them.

By comparing the results from the two states of the sky, the degree of humidity of the air up to 1000 feet high is 15 less with a clear sky than with a cloudy; from 2000 to 5000 feet it is from 4 to 6 less; at 6000 feet the air with a clear sky is much drier than at 5000, but with a cloudy sky it is nearly of the same degree of humidity, so that the difference between the two states is large, amounting to no less than 11; this difference decreases to 0 at 9000 feet, but increases to 4 at 11,000 feet; at heights exceeding 11,000 feet the air with clear skies generally becomes very dry, but with cloudy skies frequently becomes more humid, as was to be expected from the fact of the presence of clouds at heights exceeding 3 and 4 miles.

In both states of the sky at extreme elevations the air becomes very dry, but, so far as my experiments go, is never free from water.

§ 7. Comparison of the Temperature of the Dew-point, as determined by different Instruments and Methods, and Comparison of the Results together.

Table IX.—Showing the Temperature of the Dew-point, as determined at about the same height by different instruments and methods, and comparison of the results together.

Under 1000 feet.

Date.		Time.	Height.	Dew-point temperatures. Calculated from Dry and Wet (free).	Calculated from Dry and Wet (aspirated).	Observed by Daniell's Hygrometer.	Observed by Regnault's Hygrometer.	Temperature of the dew-point as determined by Dry and Wet (free) above that by Dry and Wet (aspirated).	Dry and Wet (free) above that by Daniell's Hygrometer.	Dry and Wet (free) above that by Regnault's Hygrometer.	Dry and Wet (aspirated) above that by Daniell's Hygrometer.	Dry and Wet (aspirated) above that by Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
	d	h m	feet.	°	°	°	°	°	°	°	°	°	°
Aug.	31	6 0	ground	56·7	..	57·0	..	..	−0·3				
		6 53⅛	812	46·8	..	48·0	..	..	−1·2				
		6 59½	704	51·6	..	51·0	..	..	+0·6				
Sept.	29	7 12	ground	43·4	42·4	43·5	..	+1·0	−0·1	..	−1·1		
Jan.	12	2 5	ground	36·0	..	35·0	..	..	+1·0				
Apr.	6	4 8	ground	38·5	..	40·0	..	..	−1·5				
		5 25	ground	36·7	..	37·0	37·5	..	−0·2	−0·7	..	..	−0·5
June	13	....	ground	44·1	..	..	44·0	..	..	+0·7			
	27	6 31	ground	49·	..	..	45·6	..	..	+3·5			

Between 1000 to 2000 feet.

Date.		Time.	Height.	Dry and Wet (free).	Dry and Wet (aspirated).	Daniell's Hygrometer.	Regnault's Hygrometer.	D. & W. (free) above D. & W. (aspirated).	D. & W. (free) above Daniell's.	D. & W. (free) above Regnault's.	D. & W. (aspirated) above Daniell's.	D. & W. (aspirated) above Regnault's.	Daniell's above Regnault's.
Aug.	31	6 50⅙	1803	45·4	..	45·0	..	..	+0·4				
		6 54	1287	50·0	..	50·0	..	..	0·0				
		6 54⅓	1775	48·2	..	49·0	..	..	−0·8				
		6 55½	1995	45·9	..	46·5	..	..	−0·6				
		6 57½	1200	49·5	..	50·0	..	..	−0·5				
		6 58	1171	49·5	..	50·0	..	..	−0·5				
Oct.	9	5 31	1976	38·8	..	40·0	..	..	−1·2				
		5 32½	1930	40·7	..	40·0	..	..	+0·7				
		5 34½	1827	40·7	..	40·0	..	..	+0·7				
		5 36	1586	41·4	..	41·0	..	..	+0·4				
		5 3[illegible]	1782	42·1	..	43·0	..	..	−0·9				
June	3	7 3¼	1982	39·0	..	..	40·5	..	..	−1·5			

Table IX. (*continued.*)

Between 2000 to 3000 feet.

Date.		Time.	Height.	Dew-point temperatures. Calculated from Dry and Wet (free).	Calculated from Dry and Wet (aspirated).	Observed by Daniell's Hygrometer.	Observed by Regnault's Hygrometer.	Temperatures of the dew-point as determined by Dry and Wet (free) above that by Dry and Wet (aspirated).	Dry and Wet (free) above that by Daniell's Hygrometer.	Dry and Wet (free) above that by Regnault's Hygrometer.	Dry and Wet (aspirated) above that by Daniell's Hygrometer.	Dry and Wet (aspirated) above that by Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
	d	h m	feet.	°	°	°	°	°	°	°	°	°	°
Aug.	31	6 16	2270	46·4	..	48·0	..	..	−1·6				
		6 49½	2466	42·8	..	43·0	..	..	−0·2				
Sept.	29	7 47⅝	2129	40·8	..	41·0	..	..	−0·2				
		7 50	2197	40·9	40·7	..	..	+0·2					
Oct.	9	5 15	2369	34·9	..	28·5	..	..	+6·4				
		5 25¾	2905	31·4	..	31·5	..	..	−0·1				
		5 26	2554	32·2	..	33·5	..	..	−1·3				
		5 27	2386	33·2	..	34·0	..	..	−0·8				
		5 29	2072	37·5	..	36·0	..	..	+1·5				
		5 30	2042	38·6	..	38·5	..	..	+0·1				
		5 39	2120	40·7	..	..	41·0	..	..	−0·3			
		5 40	2124	40·9	..	41·0	..	..	−0·1				
Jan.	12	2 18	2010	42·0	42·0	..	..	0·0					
		2 19	2204	38·5	37·5	..	37·0	+1·0	..	+1·5	..	+0·5	
		2 20	2639	37·9	37·9	..	..	0·0					
		2 21	2686	37·7	37·5	..	..	+0·2					
		2 23	2775	37·5	37·5	..	..	0·0					
Apr.	6	4 14½	2170	34·0	..	..	35·0	..	..	−1·0			
		4 56½	2691	31·8	..	..	34·0	..	..	−2·2			
June	20	6 23	2786	47·6	..	..	48·3	..	..	−0·7			
		6 38	2820	48·5	..	..	48·0	..	..	+0·5			

From 3000 to 4000 feet.

Date.		Time.	Height.	Dry and Wet (free).	Dry and Wet (aspirated).	Daniell's Hygrometer.	Regnault's Hygrometer.	D. & W. (free) above D. & W. (aspirated).	D. & W. (free) above Daniell's.	D. & W. (free) above Regnault's.	D. & W. (aspirated) above Daniell's.	D. & W. (aspirated) above Regnault's.	Daniell's above Regnault's.
Aug.	31	6 18½	3263	40·4	..	45·0	..	..	−4·6				
Sept.	29	7 52½	3278	35·9	..	35·5	..	..	+0·4				
		10 15½	3529	24·6	..	25·0	..	..	−0·4				
Oct.	9	4 58	3679	27·3	..	28·0	..	..	−0·7				
		4 59	3548	27·7	..	27·5	..	..	+0·2				
		5 0	3268	29·0	..	..	29·0	..	..	0·0			
		5 4½	3125	29·6	..	25·5	..	..	+4·1				
		5 7	3272	29·6	..	26·0	..	..	+3·6				
		5 20½	3275	30·2	..	28·0	..	..	+2·2				
		5 43	3326	32·4	..	33·0	..	..	−0·6				
April	6	4 18	3507	31·5	..	32·0	..	..	−0·5				
June	13	7 8	3031	39·8	..	..	38·5	..	..	+1·3			
		7 20	3461	37·0	..	..	37·5	..	..	−0·5			
		7 23½	3327	41·0	..	..	40·0	..	..	+1·0			
June	20	6 38	2820	48·5	..	..	48·0	..	..	+0·5			
		6 56	3390	47·7	..	..	47·0	..	..	+0·7			
June	27	7 12	3871	37·4	..	..	39·2	..	..	−1·8			

TABLE IX. (*continued.*)

From 4000 to 5000 feet.

Date.		Height.	Dew-point temperatures. Calculated from: Dry and Wet (free).	Dew-point temperatures. Calculated from: Dry and Wet (aspirated).	Dew-point temperatures. Observed by: Daniell's Hygrometer.	Dew-point temperatures. Observed by: Regnault's Hygrometer.	Temperatures of the dew-point as determined by Dry and Wet (free) above that by: Dry and Wet (aspirated).	Dry and Wet (free) above that by: Daniell's Hygrometer.	Dry and Wet (free) above that by: Regnault's Hygrometer.	Dry and Wet (aspirated) above that by: Daniell's Hygrometer.	Dry and Wet (aspirated) above that by: Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
d	h m	feet.	°	°	°	°	°	°	°	°	°	°
Aug. 31	6 20⅓	4632	33·7	..	34·0	..	..	−0·3				
	6 46¼	4009	33·7	..	35·0	..	..	−1·3				
Sept. 29	7 57	4398	31·6	32·1	..	..	−0·5	..				
Oct. 9	4 55	4409	24·2	..	..	24·0	..	..	+0·2			
	4 55⅛	4302	25·3	..	26·0	..	..	−0·7				
	4 57	4024	26·0	..	..	26·0	..	..	0·0			
Jan. 12	2 30	4044	27·4	..	..	27·5	..	..	−0·1			
June 20	6 31	4006	47·1	..	..	48·0	..	..	−0·9			
	6 50	4271	49·2	..	..	49·0	..	..	+0·2			
27	7 17	4131	36·4	..	..	34·5	..	..	+1·9			
Aug. 29	4 15	4730	44·3	..	..	43·5	..	..	+0·8			

From 5000 to 6000 feet.

Aug. 31	6 21⅛	5844	29·6	..	30·0	..	..	−0·4				
	6 42	5891	31·0	..	31·5	..	..	−0·5				
Sept. 29	8 1	5789	25·2	..	26·0	..	..	−0·8				
	10 11	5613	24·9	..	25·0	..	..	−0·1				
Oct. 9	4 38	5499	25·5	..	..	26·0	..	..	−0·5			
	4 52½	5600	22·7	..	..	21·0	..	..	+1·7			
	4 53	5054	23·4	..	22·0	..	..	+1·4				
Jan. 12	2 31½	5200	26·5	..	..	26·1	..	..	+0·4			
	2 33	5610	28·8	..	..	29·5	..	..	−0·7			
April 6	4 25	5827	32·2	..	..	33·2	..	..	−1·0			

From 6000 to 7000 feet.

Aug. 31	6 22	6627	22·5	..	25·0	..	..	−2·5				
Sept. 29	8 5	6429	25·9	..	26·5	..	..	−0·6				
	8 7	6385	23·4	..	21·0	..	..	+2·4				
	8 9	6647	24·7	..	21·0	..	..	+3·7				
	8 11	6966	20·2	..	20·5	..	..	−0·3				
Oct. 9	4 40	6506	22·3	..	..	22·0	..	..	+0·3			
	4 41	6732	22·2	..	22·2	..	..	0·0				
	4 41½	6796	21·8	..	..	21·0	..	..	+0·8			
	4 49	6731	17·7	..	20·0	..	..	−2·3				
April 6	4 27½	6882	35·4	..	33·0	..	..	+2·4				

TABLE IX. (*continued.*)

From 7000 to 8000 feet.

Date.		Height.	Dew-point temperatures. Calculated from: Dry and Wet (free).	Dew-point temperatures. Calculated from: Dry and Wet (aspirated).	Dew-point temperatures. Observed by: Daniell's Hygrometer.	Dew-point temperatures. Observed by: Regnault's Hygrometer.	Temperatures of the dew-point as determined by Dry and Wet (free) above that by: Dry and Wet (aspirated).	Dry and Wet (free) above that by: Daniell's Hygrometer.	Dry and Wet (free) above that by: Regnault's Hygrometer.	Dry and Wet (aspirated) above that by: Daniell's Hygrometer.	Dry and Wet (aspirated) above that by: Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
d	h m	feet.	°	°	°	°	°	°	°	°	°	°
Aug. 31	6 24⅛	7549	19·0	..	22·0	..	..	−3·0				
	6 28	7912	18·8	..	19·5	..	..	−0·7				
	6 28½	7912	18·8	..	20·0	..	..	−1·2				
	6 32	7912	18·8	..	19·5	..	..	−0·7				
	6 37	7022	27·4	..	28·0	..	..	−0·6				
Oct. 9	4 43	7184	16·9	..	..	20·0	..	..	−3·1			
	4 45	7252	19·8	..	20·0	..	..	−0·2				
	4 46½	7310	18·0	..	..	19·0	..	..	−1·0			
Jan. 12	2 52	7602	9·8	..	..	6·0	..	..	+3·8			
	3 0	7775	10·6	..	..	11·2	..	..	−0·6			
	3 2	7931	4·2	−0·8	..	..	+5·0					
April 6	4 48	7036	29·5	..	..	24·5	..	..	+5·0			
Aug. 29	4 25	7158	37·1	..	..	38·0	..	..	−0·9			
	4 26½	7578	30·2	..	..	29·5	..	..	+0·7			
	5 16	7352	19·2	..	..	19·0	..	..	+0·2			

From 8000 to 9000 feet.

Sept. 29	8 16	8041	13·8	..	15·0	..	..	−1·2				
	8 18	8259	16·4	14·7	..	..	+1·7					
	8 20	8446	17·9	15·5	..	..	+2·4					
	10 7	8439	−6·9	..	−5·0	..	..	−1·9				
Jan. 12	3 9	8894	7·2	8·5	..	..	−1·3					
April 6	4 30	8083	25·3	..	..	25·0	..	..	+0·3			

From 9000 to 10,000 feet.

Sept. 29	10 5½	9425	−5·8	..	−5·0	..	..	−0·8				
Jan. 12	3 11	9105	−0·5	−0·2	..	..	−0·3					
	3 15½	9500	8·6	13·5	..	..	−4·9					
	3 16	9500	−3·5	−7·5	−2·0	−2·0	+4·0	−1·5	−1·5	−5·5	−5·5	0·0
	3 16½	9500	3·8	4·5	..	..	−0·7					
	3 18	9586	1·3	1·5	..	..	−0·2					
	3 19	9822	7·8	1·5	..	..	+6·3					
April 6	4 34½	9090	20·0	..	..	18·2	..	..	+1·8			
Aug. 29	5 9	9740	21·2	..	..	20·0	..	..	+1·2			

From 10,000 to 11,000 feet.

Jan. 12	3 21½	10093	−1·7	..	−2·0	..	..	+0·3				
April 6	4 38	10987	16·3	..	..	16·0	..	..	+0·3			

Table IX. (*continued.*)

From 11,000 to 12,000 feet.

Date.	Height.	Dew-point temperatures. Calculated from Dry and Wet (free).	Dew-point temperatures. Calculated from Dry and Wet (aspirated).	Dew-point temperatures. Observed by Daniell's Hygrometer.	Dew-point temperatures. Observed by Regnault's Hygrometer.	Dry and Wet (free) above that by Dry and Wet (aspirated).	Dry and Wet (free) above that by Daniell's Hygrometer.	Dry and Wet (free) above that by Regnault's Hygrometer.	Dry and Wet (aspirated) above that by Daniell's Hygrometer.	Dry and Wet (aspirated) above that by Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
d h m	feet.	°	°	°	°	°	°	°			
Sept. 29 8 40	11592	−2·7	..	2·5	..	..	−5·2				
8 41	11654	−1·4	..	3·0	..	..	−4·4				
Jan. 12 3 28	11664	−7·2	..	0·0	..	..	−7·2				

From 12,000 to 13,000 feet.

Date.	Height.	Calculated from Dry and Wet (free).	Calculated from Dry and Wet (aspirated).	Observed by Daniell's Hygrometer.	Observed by Regnault's Hygrometer.	Dry and Wet (free) above that by Dry and Wet (aspirated).	Dry and Wet (free) above that by Daniell's Hygrometer.	Dry and Wet (free) above that by Regnault's Hygrometer.	Dry and Wet (aspirated) above that by Daniell's Hygrometer.	Dry and Wet (aspirated) above that by Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
Sept. 29 8 44½	12305	6·1	..	5·0	..	..	+1·1	..			
8 58	12593	12·5	..	13·0	..	..	−0·5	..			
8 59	12926	11·5	..	13·5	..	..	−2·0	..			
9 0	12926	9·5	..	11·0	..	..	−1·5	..			
10 0	12504	−1·7	..	−6·0	..	..	+4·3	..			
Aug. 29 4 39	12973	16·0	..	..	12·0	..	..	+4·0			
5 3	12866	0·4	..	..	0·0	..	..	+0·4			

From 13,000 to 14,000 feet.

Date.	Height.	Calculated from Dry and Wet (free).	Calculated from Dry and Wet (aspirated).	Observed by Daniell's Hygrometer.	Observed by Regnault's Hygrometer.	Dry and Wet (free) above that by Dry and Wet (aspirated).	Dry and Wet (free) above that by Daniell's Hygrometer.	Dry and Wet (free) above that by Regnault's Hygrometer.	Dry and Wet (aspirated) above that by Daniell's Hygrometer.	Dry and Wet (aspirated) above that by Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
Sept. 29 9 4	13025	13·3	..	14·0	..	..	−0·7				
9 10	13279	9·8	..	12·0	..	..	−2·2				
9 12	13882	10·1	..	11·5	..	..	−1·4				
9 15	13791	3·5	..	11·1	..	..	+2·4				
9 52	13175	6·4	..	7·0	..	..	−0·6				
9 56	13947	−0·5	..	0·0	..	..	−0·5				
9 57	13947	−6·0	..	−3·0	..	..	−3·0				

From 14,000 to 15,000 feet.

Date.	Height.	Calculated from Dry and Wet (free).	Calculated from Dry and Wet (aspirated).	Observed by Daniell's Hygrometer.	Observed by Regnault's Hygrometer.	Dry and Wet (free) above that by Dry and Wet (aspirated).	Dry and Wet (free) above that by Daniell's Hygrometer.	Dry and Wet (free) above that by Regnault's Hygrometer.	Dry and Wet (aspirated) above that by Daniell's Hygrometer.	Dry and Wet (aspirated) above that by Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
Sept. 29 9 48	14308	7·2	..	8·0	..	..	−0·8	..			
9 49	14031	6·9	..	8·0	..	..	−1·1				
Aug. 29 4 56	14086	−2·4	..	..	−3·0	..	..	+0·6			

Table X.

Heights between		Excess of Temperature of the Dew-point as found by Dry and Wet Thermometers (free) above that found by Daniell's Hygrometer.	No. of obs.	Regnault's Hygrometer.	No. of obs.
feet.	feet.	°		°	
0 to	1000	−0·2	7	+1·2	3
1000 ,,	2000	−0·2	11	−1·5	1
2000 ,,	3000	+0·4	10	−0·4	6
3000 ,,	4000	+0·4	10	+0·2	6
4000 ,,	5000	−0·8	3	+0·3	7
5000 ,,	6000	−0·1	5	0·0	5
6000 ,,	7000	+0·3	8	+0·5	2
7000 ,,	8000	−1·1	6	+0·5	8
8000 ,,	9000	−1·5	2	+0·3	1
9000 ,,	10000	−1·5	1	+0·5	3
10000 ,,	11000	+0·3	1	+1·5	2
11000 ,,	12000	−5·6	3	......	...
12000 ,,	13000	+0·3	5	+2·2	2
13000 ,,	14000	−0·8	7	......	...
14000 ,,	15000	−1·0	2	+0·6	1

In the experiments of every year there seems to be no certain difference in the determinations of the temperature of the dew-point by Daniell's and Regnault's hygrometers, and this temperature, determined by the use of the dry- and wet-bulb thermometers, seems to be very closely approximate indeed to the results obtained by either of these instruments, as can be seen by the following comparison of results as found from all the simultaneous determinations of the temperature of the dew-point by Daniell's hygrometer and the dry- and wet-bulb thermometers (free).

The temperature of the dew-point by the dry- and wet-bulb (free) Exps.
up to 1000 feet was 0·1 lower than by Daniell's hygrometer, from 21.
From 1000 to 2000 feet was 0·1 lower than by ,, from 40.
2000 to 3000 feet was 0·1 lower than by ,, from 54.
3000 to 4000 feet was the same as by ,, from 60.
4000 to 5000 feet was 0·4 lower than by ,, from 33.
5000 to 6000 feet was 0·6 lower than by ,, from 33.
6000 to 7000 feet was 0·2 lower than by ,, from 34.
7000 to 8000 feet was the same as by ,, from 8.
8000 to 9000 feet was 1·5 higher than by ,, from 2.
9000 to 10,000 feet was 1·2 higher than by ,, from 2.
10,000 to 11,000 feet was 0·3 higher than by ,, from 1.
11,000 to 12,000 feet was 5·6 lower than by ,, from 3.
12,000 to 13,000 feet was 0·3 higher than by ,, from 5.
13,000 to 14,000 feet was 0·8 lower than by ,, from 7.
14,000 to 15,000 feet was 1·0 lower than by ,, from 2.

The number of experiments made up to the height of 7000 feet varying from 21 to 60 in each 1000 feet, as taken in the last 3 years, is sufficient to

enable us to speak with confidence; the results are that the temperatures of the dew-point, as found by the use of the dry- and wet-bulb thermometers and my Hygrometrical Tables, are worthy of full confidence up to this point. At heights exceeding 7000 feet, the three years' experiences do not yield a sufficient number of experiments to give satisfactory results. Before we can speak with certainty at these elevations more experiments must be made.

Table XI.—Simultaneous readings of a delicate blackened bulb thermometer fully exposed to the sun's rays, and of a delicate thermometer carefully shaded from the influence of the sun, the bulbs of the two instruments being within 3 inches of each other, together with observations by Herschel's actinometer, at different elevations.

August 31, 1863.

Time of observation.	Height above mean sea-level.	Temperature of Shaded Thermometer.	Temperature of Blackened Bulb Thermometer.	Excess of reading of Blackened Bulb Thermometer.	Remarks.
h m s	feet.	°	°	°	
6 15 40 p.m.	1963	51·5	52·0	+0·5	Sun shining.
19 0 „	4167	45·2	46·0	+0·8	
20 40 „	5403	42·0	42·5	+0·5	
24 0 „	7315	34·0	37·0	+3·0	Blue sky.
32 0 „	7912	34·0	37·0	+3·0	
34 0 „	7621	36·0	39·0	+3·0	Blue sky.
37 0 „	7022	38·0	39·0	+1·0	
37 30 „	6898	38·5	38·2	−0·3	Losing sight of the sun.
42 30 „	5289	38·5	39·0	+0·5	
46 15 „	4009	41·5	42·0	+0·5	In basin of cloud; misty.
47 30 „	3480	42·1	42·5	+0·4	
51 30 „	1193	48·2	48·5	+0·3	
55 30 „	1995	50·0	51·0	+1·0	In clouds.

September 29, 1863.

7 52 0 a.m.	2870	42·0	43·0	+1·0	Faint sun.
7 59 0 „	5314	35·2	36·0	+0·8	
8 0 0 „	5473	33·8	34·2	+0·4	The liquid in the chamber of the actinometer fully exposed did not move at all.
3 0 „	6117	31·5	32·0	+0·5	
4 0 „	6325	31·3	31·8	+0·5	
5 0 „	6429	30·5	31·5	+1·0	
6 0 „	6385	30·0	31·0	+1·0	
11 30 „	7201	28·5	29·2	+0·7	Faint gleams of light.
13 0 „	7671	27·2	28·1	+0·9	The reading of the actinometer did not change.
20 0 „	8446	26·2	27·2	+1·0	
28 0 „	9563	21·5	23·0	+1·5	A faint sun.
32 0 „	10646	18·1	18·4	+0·3	Gleams of sun.

Table XI.—September 29 (*continued*).

Time of observation.	Height above mean sea-level.	Temperature of Shaded Thermometer.	Temperature of Blackened Bulb Thermometer.	Excess of reading of Blackened Bulb Thermometer.	Remarks.
h m s	feet.	°	°	°	
8 44 30 a.m.	12416	12·2	12·5	+0·3	No sun.
47 0 „	12414	14·2	16·5	+2·3	
49 0 „	12857	16·2	16·2	0·0	Clouds above.
53 0 „	12666	17·8	20·0	+2·2	
54 0 „	12533	17·8	19·5	+1·7	The reading of the actinometer decreased on exposing it to the sun.
57 0 „	12704	17·5	20·9	+3·4	
9 0 0 „	12926	11·5	13·0	+1·5	
3 0 „	13025	15·0	15·0	0·0	Sun shining.
7 0 „	13030	15·0	16·5	+1·5	A bright sun. The increase of scale reading by the actinometer was 5 divisions in 1^m.
8 0 „	13160	16·0	19·0	+3·0	
13 0 „	14218	13·1	13·1	0·0	
15 0 „	13791	12·2	12·2	0·0	
23 0 „	13695	7·2	10·0	+2·8	Sun shining. The scale reading of the actinometer increased 3 divisions; then 4 divs.; then 5 divs. in 1^m, and decreased 3 divisions in the shade in 1^m.
28 0 „	13807	3·0	6·0	+3·0	
31 0 „	15517	2·0	4·6	+2·6	
33 0 „	16590	0·0	0·0	0·0	
36 0 „	14219	7·5	10·0	+2·5	
38 0 „	14175	6·0	8·5	+2·5	Sun shining brightly. The increase of actinometer scale divisions in 1^m was 7 divisions.
43 0 „	13897	6·0	8·5	+2·5	
47 0 „	14155	9·5	12·0	+2·5	
49 0 „	14031	13·0	17·1	+4·1	Sun shining. The actinometer increased 8 divisions in one minute; then 7 divisions in one minute; and then 8 divisions in one minute.
49 30 „	13175	13·9	19·0	+5·1	
50 0 „	13175	14·1	18·9	+4·8	
52 0 „	13175	15·1	18·9	+3·8	
54 0 „	14459	13·1	15·2	+2·1	
55 0 „	14347	13·2	15·0	+1·8	
56 0 „	13947	13·5	17·2	+3·7	
57 0 „	13947	13·2	17·5	+4·3	
58 0 „	13332	14·1	19·0	+4·9	
59 0 „	12642	17·0	21·0	+4·0	
10 3 30 „	10534	21·0	25·2	+4·2	
4 0 „	10284	22·0	27·0	+5·0	
5 0 „	9671	23·0	28·5	+5·5	
6 0 „	9179	25·2	29·5	+4·3	
6 30 „	8933	26·0	30·0	+4·0	
7 30 „	8209	27·0	31·9	+4·9	The increase of scale division in 1^m by the actinometer was 20 divs.; then 25 divs., and at 2500 ft. 25 divs. The actinometer increase in 1^m was 48 divs.
11 0 „	5618	34·5	39·0	+4·5	
16 0 „	3224	41·2	49·2	+8·0	
17 0 „	2828	42·0	49·0	+7·0	
19 0 „	2039	47·0	53·0	+6·0	
40 0 „	ground.	......	......	......	

January 12, 1864.

Time of observation.	Height above mean sea-level.	Temperature of		Excess of reading of Blackened Bulb Thermometer.	Remarks.
		Shaded Thermometer.	Blackened Bulb Thermometer.		
h m s	feet.	°	°	°	
2 5 0 p.m.	ground	42·0	41·8	−0·2	Atmosphere thick and misty.
9 0 ,,	655	40·0	39·5	−0·5	Over the river Thames.
13 0 ,,	1336	41·0	41·0	0·0	
16 0 ,,	1816	43·0	43·5	+0·5	
20 0 ,,	2639	44·0	44·0	0·0	Cloudy.
21 0 ,,	2687	44·0	44·0	0·0	
21 30 ,,	2735	44·0	44·1	+0·1	
23 0 ,,	2775	44·0	44·0	0·0	
24 0 ,,	2689	44·2	44·0	−0·2	
25 0 ,,	2689	44·5	45·0	+0·5	
26 0 ,,	3005	44·5	44·7	+0·2	
27 0 ,,	3282	43·5	43·0	−0·5	
28 30 ,,	3821	41·5	41·5	0·0	
34 0 ,,	5924	32·2	32·0	−0·2	
34 30 ,,	6144	31·5	32·7	+1·2	
41 0 ,,	6678	30·0	30·0	0·0	
41 30 ,,	6650	29·5	29·3	−0·2	Cloudy.
47 0 ,,	6984	30·8	30·7	−0·1	
50 0 ,,	7277	31·0	31·0	0·0	
56 0 ,,	7614	29·2	29·2	0·0	
57 0 ,,	7044	30·5	30·5	0·0	
58 0 ,,	8118	30·5	30·5	0·0	
3 2 0 ,,	7931	27·2	28·0	+0·8	
3 0 ,,	8086	27·2	27·5	+0·3	
4 0 ,,	8189	27·2	27·2	0·0	
6 0 ,,	8346	26·5	26·5	0·0	
8 0 ,,	8766	26·0	26·0	0·0	
10 0 ,,	9104	24·5	24·5	0·0	
15 0 ,,	9437	20·5	20·5	0·0	
15 30 ,,	9500	20·5	20·5	0·0	
16 0 ,,	9500	20·5	20·5	0·0	
16 30 ,,	9500	20·5	20·5	0·0	
17 30 ,,	9560	21·0	21·0	0·0	
18 0 ,,	9586	21·0	21·0	0·0	
19 0 ,,	9822	20·0	20·0	0·0	Cloudy.
21 0 ,,	10090	17·2	17·2	0·0	
21 20 ,,	10090	17·2	17·1	−0·1	
21 40 ,,	10319	16·2	16·2	0·0	
22 30 ,,	10469	15·5	15·2	−0·3	
23 0 ,,	10469	15·0	15·0	0·0	
24 0 ,,	10619	14·0	14·0	0·0	
38 15 ,,	10289	16·2	16·5	+0·3	
38 30 ,,	10221	16·2	16·2	0·0	
39 0 ,,	10085	16·2	16·2	0·0	
39 10 ,,	10017	16·2	16·2	0·0	
39 10 ,,	9921	16·5	16·5	0·0	In snow.
39 30 ,,	9516	16·8	16·8	0·0	
39 45 ,,	9408	17·2	17·2	0·0	
40 0 ,,	9273	18·0	18·2	+0·2	
40 30 ,,	9316	18·0	18·2	+0·2	
41 0 ,,	9199	18·5	18·5	0·0	
41 45 ,,	8939	21·0	21·0	0·0	
42 30 ,,	8765	21·0	21·0	0·0	No use could be made of the actinometer at all in this ascent.
44 30 ,,	7993	22·5	22·5	0·0	
47 0 ,,	7447	23·2	23·2	0·0	
53 0 ,,	5465	28·5	28·5	0·0	
54 30 ,,	5142	30·3	30·5	+0·2	
1 0 ,,	3091	37·2	37·5	+0·3	

April 6, 1864.

Time of observation.	Height above mean sea-level.	Temperature of		Excess of reading of Blackened Bulb Thermometer.	Remarks.
		Shaded Thermometer.	Blackened Bulb Thermometer.		
h m s	feet.	°	°	°	
4 10 10 p.m.	867	42·0	43·0	+1·0	Very misty.
16 0 ,,	2775	34·5	35·9	+1·4	
19 0 ,,	3884	32·0	34·1	+2·1	
20 30 ,,	4404	34·2	35·5	+1·3	Cloudy.
23 0 ,,	5251	36·2	38·1	+1·9	
25 0 ,,	5827	36·0	36·2	+0·2	
26 0 ,,	6500	34·2	34·8	+0·6	
29 0 ,,	7493	40·2	42·1	+1·9	
34 0 ,,	8854	34·2	35·1	+0·9	
36 0 ,,	10155	35·2	41·0	+5·8	
39 0 ,,	10470	43·0	48·5	+5·5	Sun shining; could not get the sun to shine full on the actinometer, and did not succeed in obtaining one good result.
42 0 ,,	8642	46·8	51·0	+4·2	
43 0 ,,	7783	47·0	52·0	+5·0	
44 30 ,,	7524	46·2	53·0	+6·8	
46 0 ,,	7869	46·0	53·0	+7·0	
46 30 ,,	7947	46·0	53·0	+7·0	
47 30 ,,	7410	46·2	54·0	+7·8	
48 0 ,,	7036	46·2	53·7	+6·5	
50 30 ,,	6153	44·0	47·0	+3·0	Entered cloud.
54 0 ,,	3821	41·0	41·0	0·0	

June 13, 1864.

7 7 15 p.m.	2880	52·2	53·0	+0·8	
10 0 ,,	2837	51·7	53·0	+1·3	
11 30 ,,	2380	52·8	55·5	+2·7	Sun bright.
12 0 ,,	2300	53·3	56·0	+2·7	
17 30 ,,	3106	47·2	47·5	+0·3	
19 0 ,,	3350	46·7	46·3	−0·4	
32 45 ,,	3349	48·2	48·5	+0·3	
46 30 ,,	2550	51·5	52·0	+0·5	

June 20, 1864.

6 19 30 p.m.	1550	59·0	59·0	0·0	
20 30 ,,	2006	58·2	58·2	0·0	Misty all round.
21 30 ,,	2236	58·2	58·3	+0·1	

June 27, 1864.

6 35 0 p.m.	610	60·1	59·2	−0·9	
35 0 ,,	719	59·5	59·0	−0·5	
37 0 ,,	865	58·5	58·0	−0·5	
38 30 ,,	1054	57·8	57·0	−0·8	
42 30 ,,	1497	56·5	55·0	−1·5	
49 18 ,,	717	58·0	56·8	−1·2	
52 0 ,,	1019	57·0	55·9	−1·1	
7 3 30 ,,	1514	54·5	54·0	−0·5	
4 0 ,,	1578	54·0	53·5	−0·5	Sun at the edge of cloud.
12 0 ,,	3871	46·2	45·0	−1·2	
19 0 ,,	3845	43·1	42·0	−1·1	
25 0 ,,	3322	47·2	45·0	−2·2	Sun shining on the blackened bulb thermometer.
39 30 ,,	4796	44·1	41·5	−2·6	
53 0 ,,	3958	42·0	41·5	−0·5	
8 3 30 ,,	2994	43·0	44·0	+1·0	

August 29, 1864.

Time of observation.	Height above mean sea-level.	Temperature of Shaded Thermometer.	Temperature of Blackened Bulb Thermometer.	Excess of reading of Blackened Bulb Thermometer.	Remarks.
h m s	feet.	°	°	°	
4 17 0 p.m.	4730	54·2	54·0	−0·2	
17 30 „	5066	54·2	54·8	−0·6	
20 0 „	5767	54·2	52·0	−2·2	
26 30 „	7578	50·2	52·0	+1·8	
38 20 „	12700	33·5	35·0	+1·5	
39 0 „	12773	32·8	35·2	+2·4	
44 0 „	14000	34·6	42·0	+7·4	Sun hot.
47 30 „	14317	35·5	42·0	+6·5	
49 30 „	14581	34·2	35·5	+1·5	
55 0 „	14086	31·0	37·0	+6·0	
5 11 0 „	9268	36·2	42·0	+5·8	
11 30 „	9143	37·2	43·0	+5·8	
16 0 „	9352	42·5	51·0	+8·5	

On August 31, at the height of 7000 and 8000 feet high, the blackened bulb thermometer exposed to the full influence of the sun, read 3° only higher than the shaded thermometer.

On September 29, at the height of 14,000 feet, the excess of reading of the blackened bulb thermometer was $2\frac{1}{2}$° only under a bright sun, and the increase of readings of the actinometer was 3 divisions to 5 divisions only; at 13,000 feet the excess of blackened bulb readings increased to 4° and 5°, and the increase in one minute of the actinometer readings were 7 to 8 divisions. At the height of 3000 and 4000 feet the influence of the sun increased, raising the blackened bulb to 7° and 8° in excess of the readings of the shaded thermometer; the scale readings of the actinometer increased to 20 and 25 divisions in one minute, and on reaching the ground the increase in the same time was from 48 to 50 divisions.

On January 12 the readings of the exposed and shaded thermometers were nearly always alike.

On April 6 I was unable to use the actinometer, and never succeeded in placing it properly. The excess of reading of the blackened bulb thermometer was but small during the cloudy state of the sky, and increased to 5° and 6° at 10,000 feet, this excess becoming larger on descending into the lower atmosphere, until cloud was entered.

On June 13 the excess was at all times small.

On June 20, at many inspections the readings of the two thermometers were identical.

On June 27 the exposed thermometer nearly always read lower than the shaded thermometer; on examination of these instruments afterwards, they were both found to read correctly.

On August 29 the blackened bulb thermometer read lower than the shaded thermometer, when 6000 feet were passed; it then read higher, increasing to 7° at 14,000 feet high.

From all these experiments it seems that the heat-rays from the sun for the small bulb of a thermometer, communicate very little or no heat to it, and the heat is less in proportion to the less density of the atmosphere; similar results being shown by the use of Herschel's actinometer.

On the Oxygenic condition of the Atmosphere.

August 31, 1863.

At $6^h\ 20^m\ 30^s$ p.m., at 4907 feet. There was no ozone.
At $6^h\ 37^m\ 30^s$ p.m., at 6898 feet. There was no ozone.

September 29, 1863.

At $8^h\ 1^m$ a.m., at 5789 feet. There was no ozone by paper test.
At $8^h\ 2^m$ a.m., at 6000 feet. No ozone by powder test.
At $8^h\ 41^m$ a.m., at 11,654 feet. Ozone by powder tinged to 4.
At $9^h\ 16^m$ a.m., at 13,805 feet. No ozone by paper.
At $9^h\ 57^m$ a.m., at 13,947 feet. No ozone.
At $9^h\ 57^m\ 30^s$ a.m., at 13,747 feet. Ozone powder coloured to 8.

January 12, 1864.

At $2^h\ 57^m$ p.m., at 7044 feet. Ozone=1.
At $3^h\ 6^m$ p.m., at 8346 feet. Ozone=1.
At $3^h\ 10^m$ p.m., at 9104 feet. Ozone=1.
At $3^h\ 16^m$ p.m., at 9500 feet. Ozone=1. Iodide paper coloured to 1.
At $3^h\ 17^m$ p.m., at 9536 feet. Ozone=1. Iodide paper coloured to 1.

June 27, 1864.

At $7^h\ 2^m$ p.m., at 1134 feet. Ozone paper tinged to 1, powder to 2.
At $7^h\ 36^m$ p.m., at 4270 feet. Ozone paper tinged to 2, powder to 3.
At $7^h\ 51^m$ p.m., at 4115 feet. Ozone paper tinged to 3, powder to 4.

August 29, 1864.

At $4^h\ 33^m$ p.m., at 10,875 feet. Ozone coloured to 1.
At $4^h\ 47^m\ 30^s$ p.m., at 14,317 feet. Ozone paper coloured to 2.

Heights and Appearance of the Clouds.

August 31, 1863.

At $6^h\ 14^m\ 30^s$ p.m., at 1145 feet. Entering the clouds.
At $6^h\ 14^m\ 40^s$ p.m., at (1262) feet. Above the clouds.
At $6^h\ 15^m$ p.m., at (1496) feet. Cumulus clouds below, in detached masses.

At $6^h\ 15^m\ 40^s$ p.m., at 1963 feet. Cumulus and scud far below.

At $6^h\ 17^m\ 40^s$ p.m., at (2737) feet. Cumulus in white heaps on our level. Sun shining on some clouds, but not others.

At $6^h\ 20^m\ 30^s$ p.m., at (4907) feet. Cumulus in beautiful hills, cirrocumulus above us at angles of 45° and 75°. *Cumulus far above, the same as on July 21, 1862.*

At $6^h\ 21^m\ 30^s$ p.m., at 6404 feet. Cirrus above; clouds piled up in heaps around, above and below us, peak upon peak. A very dark cloud with a little blue in it.

At $6^h\ 25^m\ 40^s$ p.m., at (7629) feet. Cirrus, cirrocumulus and blackish-brown strata above. Clouds all shapes and sizes. Masses of cumulus in distorted forms. Rocky clouds below us.

At $6^h\ 29^m\ 50^s$ p.m., at (8033) feet. Rainbow between lower cumulus and upper clouds.

At $6^h\ 31^m$ p.m., at 8033 feet. Very small patches of cirrus.

At $6^h\ 32^m\ 30^s$ p.m., at 7912 feet. Another rainbow over clouds in rocky heaps. Colours of the clouds opposite to the sun:—Top layer (1) brown; (2) bluish black; (3) darker bluish black; (4) thin layer of white; (5) greenish brown; (6) uniform rocky clouds forming the base of everything.

At $6^h\ 35^m$ p.m., at (7480) feet. Colour of the clouds under the sun:—Top layer (1) brown; (2) dark blue; (3) whitish grey-black; (4) uniform rocky cumulus clouds.

At $6^h\ 37^m$ p.m., at 7022 feet. Patches of cumulus apparently resting on the earth.

At $6^h\ 37^m\ 10^s$ p.m., at 6980 feet. The colour of the clouds opposite to the sun:—Top layer (1) brown; (2) bluish brown; (3) rocky brown clouds; (4) bluish black; (5) uniform base of rocky cumulus.

At $6^h\ 38^m\ 30^s$ p.m., at 6626 feet. Edge of cumulus and brownish cloud tinged by the sun. The tops of the peaks of the rocky clouds on nearly the same level as ourselves. Saw straggling bits of cloud between the upper and lower strata.

At $6^h\ 43^m$ p.m., at 5389 feet. Peaks after peaks rising up to our level and clearly defined against the sky; a cloud with a little red in it, not opposite to the sun. View confined on all sides by peaks of cloud, higher on three sides than on the fourth.

At $6^h\ 44^m\ 30^s$ p.m., at 4865 feet. In a basin of clouds, higher on three sides than on the fourth.

At $6^h\ 45^m\ 30^s$ p.m., at 4452 feet. Entering into the clouds.

At $6^h\ 46^m\ 15^s$ p.m., at 4009 feet. In basin of clouds; misty.

At $6^h\ 46^m\ 40^s$ p.m., at (3886) feet. Just entering into cloud.

At $6^h\ 47^m$ p.m., at 3787 feet. Just in clouds.

At $6^h\ 47^m\ 10^s$ p.m., at (3685) feet. In white mist.

At $6^h\ 48^m\ 30^s$ p.m., at (2908) feet. Steady leaden sky above; layers of detached clouds below.

At $6^h\ 50^m$ p.m., at (2061) feet. A uniform stratum of cloud above.

At $6^h\ 54^m$ p.m., at 1287 feet. In clouds.

At $6^h\ 54^m\ 10^s$ p.m., at 1580 feet. Above the clouds. Colours of the clouds:—Top layer (1) deep greenish blue; (2) bluish black; (3) green rocky clouds; (4) slightly rocky clouds.

At $6^h\ 55^m$ p.m., at 2024 feet. In clouds again.

At $6^h\ 56^m\ 30^s$ p.m., at (1597) feet. In uniform white mist.

September 29, 1863.

Before starting the sky was cloudy.

At $7^h\ 46^m$ a.m., at 1092 feet. Misty all round, east the clearest.

At $8^h\ 4^m\ 30^s$ a.m., at 6375 feet. Clouds above and below.

At $8^h\ 5^m$ a.m., at 6429 feet. There are clouds very high above us.

At $8^h\ 18^m$ a.m., at 8259 feet. Dense clouds above us, very high indeed; there are two layers below us.

At $8^h\ 20^m$ a.m., at 8446 feet. Misty.

At $8^h\ 24^m$ a.m., at 9193 feet. Many clouds apparently on the ground, twelve cumuli in a patch.

At $8^h\ 25^m$ a.m., at 9252 feet. Detached cumuli apparently resting on the ground like huge swans in some places, in others as though there had been a simultaneous discharge of heavy ordnance. Three distinct layers of cloud.

At $8^h\ 34^m\ 40^s$, a.m. at 11,082 feet. Beautiful blue tinge over bed of clouds.

At $8^h\ 35^m$ a.m., at 11,062 feet. Clouds a mile above us at least.

At $8^h\ 49^m$ a.m., at 12,857 feet. Clouds above us.

At $8^h\ 52^m\ 30^s$ a.m., at 12,800 feet. Stratus clouds, some on our level and some at a higher elevation.

At $8^h\ 54^m\ 30^s$ a.m., at 12,818 feet. A very great variety of cloud.

At $8^h\ 55^m$ a.m., at 12,818 feet. Stratus on our level, sixteen distinct cumuli apparently resting on the ground, like smoke on discharging ordnance.

At $8^h\ 57^m$ a.m., at 12,704 feet. A beautiful tinge of blue over the clouds.

At $8^h\ 58^m$ a.m., at 12,593 feet. Seas of white rocky cloud; mist.

At $9^h\ 1^m$ a.m., at 12,926 feet. Counted forty separate cumuli, apparently resting on the earth.

At $9^h\ 3^m$ a.m., at 13,025 feet. Sun bringing mist up vertically.

At $9^h\ 8^m$ a.m., at 13,160 feet. Clouds are above us still.

At $9^h\ 12^m$ a.m., at 13,882 feet. Clouds are above us still.

October 9, 1863.

Before starting the sky was clear.

At $4^h\ 31^m$ p.m., at 1573 feet. The sky was cloudless except near the horicon.

At $4^h\ 44^m$ p.m., at 7193 feet. Rose coloured cumuli clouds in the S.; white in the W.; no clouds except near the horizon.

At $5^h\ 10^h$ p.m., at 2863 feet. Misty.

At $5^h\ 25^m$ p.m., at 3383 feet. The western sky is magnificent, the eastern is dotted with fine cumuli.

At $5^h\ 32^m\ 30^s$ p.m., at 1930 feet. A thin mist.

January 12, 1864.

Before starting the sky was cloudy, overcast, the air misty and thick.

At $2^h\ 20^m$ p.m., at 2639 feet. Cloudy.

At $2^h\ 21^m\ 30^s$ p.m., at 2735 feet. In fog.

At $2^h\ 41^m\ 30^s$ p.m., at 6650 feet. Cloudy.

At $3^h\ 32^m$ p.m., at 11,774 feet. Snow-granules.

At $3^h\ 36^m$ p.m., at 11,007 feet. Snow fine and thin.

At $3^h\ 41^m\ 30^s$ p.m., at 9026 feet. Clouds below us, a great dense cloud above us.

At $3^h\ 45^m$ p.m., at 7732 feet. Above cloud; line of cloud due N. and S.

At $3^h\ 47^m$ p.m., at 7447 feet. Line of cloud remarkable, very well defined.

At $3^h\ 47^m\ 30^s$ p.m., at 7226. About entering cloud.

At $3^h\ 48^m$ p.m., at 6967 feet. In cloud.

At $3^h\ 49^m$ p.m., at 6640 feet. Out of cloud.

At $3^h\ 50^m\ 30^s$ p.m., at 6040 feet. Very misty.

At $4^h\ 8^m\ 30^s$ p.m., at 1324 feet. Very misty.

April 6, 1864.

Before starting the sky was uniformly cloudy; there was no sun, and objects were misty in the distance.

At $4^h\ 10^m\ 10^s$ p.m., at 867 feet. Very misty.

At $4^h\ 14^m\ 30^s$ p.m., at 2170 feet. Misty; entering cloud.

At $4^h\ 20^m$ p.m., at 4260 feet. Two layers of cloud.

At $4^h\ 23^m$ p.m., at 5251 feet. No break in the clouds.

At $4^h\ 50^m\ 30^s$ p.m., at 6153 feet. Entered cloud.

At $4^h\ 51^m$ p.m., at 5536 feet. Stratus clouds on our level.

June 13, 1864.

Before starting the sky was cloudless, the horizon misty.
At 7^h 28^m 30^s p.m., at 3543 feet. The horizon was misty all round.

June 20, 1864.

Before starting the sky was cloudy.
At 6^h 19^m p.m., at 1462 feet. Misty all round.
At 6^h 24^m p.m., at 3086 feet. Clouds under us.
At 6^h 24^m 30^s p.m., at 3214 feet. Clouds around us.
At 6^h 25^m p.m., at 3375 feet. Entering cloud.
At 6^h 26^m p.m., at 3696 feet. In a white cloud; fog; can see nothing; the clouds are blacker above than below.
At 6^h 44^m p.m., at 3549 feet. Misty below.
At 6^h 45^m p.m., at 3669 feet. Black mist below. Clouds apparently blacker below than above, entering cloud.
At 6^h 51^m p.m., at 4271 feet. Still in cloud.
At 6^h 54^m 30^s p.m., at 4130 feet. Clouds darker.

June 27, 1864.

Before starting the sky was covered with cirrocumulus.
At 6^h 34^m 30^s p.m., at 484 feet. Misty.
At 7^h 49^m 20^s p.m., at 4471 feet. Very misty.
At 8^h 15^m 30^s p.m., at 3579 feet. Clear sky above.

August 29, 1864.

At 4^h 19^m p.m., at 5664 feet. Cirri above.

Appearance of the Sky.

August 31, 1863.

At 6^h 33^m 30^s p.m., at (7696) feet. Blue sky above.
At 6^h 54^m p.m., at 1287 feet. Sky of a greenish colour.

September 29, 1863.

At 9^h 20^m a.m., at 13,695 feet. Blue sky above.

October 9, 1863.

At 5^h 10^m p.m., at 2863 feet. Blue sky above.

June 27, 1864.

At 7^h 44^m 30^s p.m., at 4597 feet. Light blue sky.

August 29, 1864.

At 4^h 19^m p.m., at 5664 feet. Deep blue sky.

Velocity of the Wind by the Balloon, and by Robinson's Anemometer at the Royal Observatory, Greenwich.

On September 29 the balloon left Wolverhampton at 7^h 43^m a.m., and fell near Sleaford, a point 95 miles from the place of ascent, at 10^h 30^m a.m. During this time the horizontal movement of the air was 33 miles as registered at Wrottesley Observatory.

On October 9 the balloon left the Crystal Palace at 4^h 29^m p.m., and descended at Pirton Grange, a point 35 miles from the place of ascent, at 6^h 30^m p.m. Robinson's anemometer during this time registered 8 miles at the Royal Observatory, Greenwich, as the horizontal movement of the air.

On January 12 the balloon left the Royal Arsenal, Woolwich, at 2^h 8^m p.m., and descended at Lakenheath, a point 70 miles from the place of ascent, at 4^h 19^m p.m. At the Royal Observatory, by Robinson's anemometer, during this time the motion of the air was 6 miles only.

On April 6 the balloon left the Royal Arsenal, Woolwich, at 4^h 8^m p.m. Its correct path is not known, as it entered several different currents of air, the earth being invisible owing to the mist; it descended at Sevenoaks, in Kent, at 5^h 17^m p.m., a point 15 miles from the place of ascent. 5 miles was registered during this time by Robinson's anemometer at the Royal Observatory, Greenwich.

On June 13 the balloon left the Crystal Palace at 7^h 0^m p.m., and descended at East Hornden, a point 20 miles from the place of ascent, at 8^h 15^m p.m. Robinson's anemometer during this time registered 17 miles at the Royal Observatory, Greenwich.

On August 29 the balloon left the Crystal Palace at 4^h 6^m p.m., and descended at Wybridge, at 5^h 30^m p.m., a point 13 miles from the place of ascent. During this time 15 miles was registered by Robinson's anemometer at the Royal Observatory, Greenwich.

Direction of the Wind.

September 29, 1863.

Before starting, the wind was from the S.W., and remained so during the ascent and descent of the balloon.

October 9, 1863.

Before starting the wind was from the S.E.
At 4^h 34^m p.m., at 3700 feet. Changed direction from N.W. to N.
At 5^h 13^m p.m., at 2715 feet. Moving N.W. again.

January 12, 1864.

At 2^h 9^m p.m., at 655 feet. Changing direction towards the S.W.; wind N.E.
At 2^h 10^m p.m., at 1328 feet. Moving W.; wind E.
At 2^h 11^m p.m., at 1518 feet. Wind S.W.
At 2^h 19^m p.m., at 2204 feet. Wind still S.W.
At 2^h 32^m 30^s p.m., at 5401 feet. We are now going northwards; wind S.
At 3^h 3^m p.m., at 8086 feet. Changed direction; moving N.N.E.; wind S.S.W.
At 3^h 20^m p.m., at 10,017 feet. Entered a S.S.E. current.

April 6, 1864.

Before starting the wind was from the S.E.

At 4^h 14^m p.m., at 2161 feet. Entered a W.S.W. current.

On the Propagation of Sound.

August 31, 1863.

At 6^h 13^m 30^s p.m., at 648 feet. People heard shouting.

At 6^h 15^m 40^s p.m., at 1963 feet. Could hear a loud buzzing noise; railway whistle heard.

At 6^h 37^m p.m., at 7022 feet. No sound of any sort.

At 6^h 57^m 30^s p.m., at 1200 feet. Heard children's voices.

September 29, 1863.

At 8^h 13^m a.m., at 7671 feet. The report of a gun was heard.

At 8^h 46^m 30^s a.m., at (12,415) feet. The report of a gun was heard.

At 9^h 11^m 15^s a.m., at (13,602) feet. A shrill whistle in the balloon was heard as a ringing sound for 10 seconds, afterwards passing down the balloon.

At 9^h 45^m a.m., at 14,224 feet. The report of a gun again heard.

October 9, 1863.

At 4^h 39^m 30^s p.m., at 6277 feet. The deep roar of London heard.

At 4^h 40^m p.m., at 6506 feet. The roar of London deep and continuous.

At 4^h 48^m p.m., at 7087 feet. The roar of London very deep.

At 5^h 3^m p.m., at 3067 feet. Noise of London heard.

January 12, 1864.

At 2^h 46^m p.m., at 6885 feet. Can hear the ticking of a steam-threshing machine.

At 2^h 48^m p.m., at 7118 feet. Can hear people's voices.

June 13, 1864.

At 7^h 21^m p.m., at 3291 feet. Heard the report of a gun 10 seconds after seeing the flash.

June 20, 1864.

At 6^h 29^m p.m., at 4102 feet. Can hear the ticking of a watch plainly.

At 6^h 30^m p.m., at 4122 feet. Heard a railway train.

At 6^h 51^m p.m., at 4271 feet. Heard the report of a gun.

At 6^h 54^m 30^s p.m., at 4130 feet. A church clock striking.

June 27, 1864.

At 7^h 45^m p.m., at 4699 feet. Heard a dog barking.

At 7^h 53^m p.m., at 3958 feet. Can hear voices.

At 8^h p.m., at 3604 feet. The report of a gun heard.

At 8^h 6^m p.m., at 2594 feet. The report of a gun again heard.

At 8^h 8^m 30^s p.m., at 2529 feet. Heard the whistle of a railway train.

At 8^h 29^m 30^s p.m., at 2003 feet. Sounds very distinctly heard.

At 8^h 33^m p.m., at 1936 feet. A bell heard with a clear sound.

At 8^h 39^m p.m., at 2337 feet. Heard the report of a gun again.

Physiological Observations.

January 12, 1864.

At 3^h 39^m 30^s p.m., at 9516 feet. Mr. Norris reddish blue, Mr. Coxwell darker, and Mr. Glaisher redder than usual.

June 20, 1864.

At 6^h 31^m 30^s p.m., at 3938 feet. The number of pulsations in a minute were as follows:—Mr. Goodchild, 90; Mr. Allport, the same; Master Glaisher, 86; Mr. Jackson and Mr. Coxwell, 94; Mr. Glaisher, 96; Mr. Knight, 110; and Mr. Bourne, 112.

At 6^h 51^m 30^s p.m., at (4276) feet. The number of pulsations in a minute were as follows:—Mr. Allport, 84; Mr. Goodchild, 86; Mr. Knight, 90; Mr. Coxwell, 94; Mr. Jackson, 96; Mr. Bourne, 98.

June 27, 1864.

At 6^h 43^m p.m., at 1497 feet. The number of pulsations in a minute were as follows:—Mr. E. Atkinson, 78; Mr. Coxwell, 84; Mr. Glaisher, 104; Mr. Ingelow, 108; Mr. Collins, 108; Mr. Woodroffe, 120.

At 6^h 56^m p.m., at 1660 feet. The number of respirations per minute were as follows:—Mr. Collins, 11; Mr. Coxwell, 15; Mr. J. Atkinson, 17; Mr. E. Atkinson, 17; Mr. Ingelow, 18; Mr. Glaisher, $18\frac{1}{2}$; Mr. Woodroffe, 19; Mr. Ellis, 20. Mr. Collins repeated the experiment and found it still the same.

At the Alliance Inn, Brookland, at midnight. Mr. Coxwell's pulsations were 90 in a minute; Mr. Glaisher's pulsations were 88 in a minute; Mr. Collins's pulsations were 94 in a minute; Mr. J. Atkinson's pulsations were 74 in a minute.

The number of respirations per minute were as follows:—Mr. Coxwell, 18; Mr. Glaisher, 17; and Mr. Collins, 15.

August 29, 1864.

At 4^h 50^m p.m., at 14,580 feet. Mr. Glaisher's pulsations were 110, and respiration 20 in a minute.

At 4^h 52^m 30^s p.m., at 14,281 feet. Mr. Glaisher's pulsations were 97 in a minute.

At 5^h 3^m p.m., at 12,866 feet. Mr. Glaisher's pulsations were 99, Mr. Coxwell's 102, and Messrs. Norris and Cranston's each 118 in a minute. The number of respirations in one minute were as follows:—Mr. Norris, 10; Mr. Glaisher, 18; and Messrs. Coxwell and Cranston, each 22.

On the different Appearance of Gas in the Balloon.

August 31, 1863.

At 6^h 17^m 40^s p.m., at 2737 feet. Gas cloudy.

At 6^h 21^m 30^s p.m., at 6409 feet. Balloon quite full; gas very opaque, and issuing from the neck.

At 6^h 43^m 30^s p.m., at 5235 feet. Gas cloudy.

At 6^h 44^m 20^s p.m., at (4927) feet. Gas clearing; valve faintly seen.

At 6^h 45^m p.m., at 4784 feet. Gas clearer; netting visible.

At 6^h 47^m p.m., at 3787 feet. Gas clearer still, but not quite clear.

At 6^h 53^m p.m., at 859 feet. Gas clear.

At 6^h 56^m 30^s p.m., at 1597 feet. Gas beautifully clear.

September 29, 1863.

At $8^h\ 4^m$ a.m., at 6321 feet. Gas cloudy.
At $8^h\ 22^m$ a.m., at 8726 feet. Gas getting clearer.
At $9^h\ 1^m\ 15^s$ a.m., at 12,926 feet. Gas clear.

January 12, 1864.

At $2^h\ 41^m\ 30^s$ p.m., at 6650 feet. Gas opaque.

April 6, 1864.

At $4^h\ 25^m\ 30^s$ p.m., at 6163 feet. Gas clearer.

June 20, 1864.

At $6^h\ 24^m$ p.m., at 3086 feet. Gas thick and cloudy, and issuing from the neck of the balloon.
At $6^h\ 35^m$ p.m., at 3002 feet. Gas clear.
At $6^h\ 35^m\ 15^s$ p.m., at 2840 feet. Gas bright.
At $6^h\ 40^m$ p.m., at 2990 feet. Gas clear.
At $6^h\ 47^m\ 30^s$ p.m., at (3886) feet. Gas much cloudier, and issuing from the neck of the balloon.
At $6^h\ 48^m$ p.m., at 4013 feet. Gas thick.

June 27, 1864.

At $8^h\ 43^m$ p.m., at 1836 feet. Gas clear.

The Lines in the Spectrum.

September 29, 1863.

At $7^h\ 59^m$ a.m., at 5314 feet. The lines B to G in the sky spectrum visible.
At 8^h a.m., at 5473 feet. The line F is beautifully defined; cannot see A, and can just see G; sky spectrum.
At $8^h\ 6^m$ a.m., at 6385 feet. Can see B to G, sky spectrum.
At $9^h\ 14^m$ a.m., 14,096 feet. Spectrum everywhere, B to G, F very distinct; sky spectrum.
At $9^h\ 22^m$ a.m., at 13,695 feet. Sun spectrum, H clear, dark beyond.
At $9^h\ 23^m$ a.m., at 13,695 feet. Sun spectrum, A clear.
At $9^h\ 25^m$ a.m., at 13,982 feet. Lines clear and numerous in the sun spectrum, extending from A to beyond H.
At $9^h\ 41^m$ a.m., at 14,203 feet. The sun spectrum extended from A to far beyond H, and was very beautiful.
At $9^h\ 43^m$ a.m., at 13,897 feet. Line H in the spectrum clear and vivid.
At $9^h\ 44^m$ a.m., at 13,897 feet. The sun spectrum very vivid and very long; H made up of fine lines.

October 9, 1863.

At $5^h\ 7^m$ p.m., at 3272 feet. Faint spectrum on all sides.

Time of Vibration of a Horizontal Magnet.

June 27, 1864.

	h	m	s		feet								seconds.
At	6	50	30	at	903	there were	30	vibrations	of a	horizontal	magnet	in	48·0
„	7	22	15	„	3487	„	30	„	„	„	„		49·1
„	7	29	0	„	3197	„	30	„	„	„	„		49·0
„	7	32	0	„	3415	„	30	„	„	„	„		48·9
„	7	37	0	„	4467	„	30	„	„	„	„		49·2
„	7	44	0	„	4597	„	30	„	„	„	„		49·2
„	7	46	0	„	4692	„	30	„	„	„	„		49·0
„	7	57	30	„	3686	„	30	„	„	„	„		49·0
„	8	4	0	„	2744	„	30	„	„	„	„		48·7
„	8	9	30	„	2929	„	16	„	„	„	„		26·5
„	8	25	0	„	2710	„	30	„	„	„	„		48·5

At the Alliance Inn, Brookland, at 1^h a.m., on June 28, 30 vibrations of the same horizontal magnet were observed as follows:—in $47^s{\cdot}2$, $47^s{\cdot}2$, $47^s{\cdot}2$, $46^s{\cdot}5$, and in $47^s{\cdot}2$.

August 29, 1864.

At the Royal Observatory, Greenwich, at noon,

					seconds.
30	vibrations	of a	horizontal	magnet was	49·0
30	„	„	„	„	48·5
30	„	„	„	„	48·8
30	„	„	„	„	49·0

	h	m	s		feet.								seconds.
At	4	41	30	at	13,375	there were	26	vibrations	of a	horizontal	magnet	in	46·8
„	4	45	0	„	14,293	„	30	„	„	„	„		52
„	4	47	30	„	14,317	„	28	„	„	„	„		49·5

On June 27, at the average height of 3350 feet, the magnet vibrated in 1·635
On the ground at Brookland, one vibration was .... 1·698
On Aug. 29, at the average height of 14000 feet, the magnet vibrated in 1·767
At the Royal Observatory, Greenwich, one vibration was .... 1·627

Therefore the time of vibration seems to be somewhat longer in the higher atmosphere than on the ground; the difference being somewhat greater than as shown above in consequence of the higher temperature of the earth.

General Observations.

August 31, 1863.

At $6^h\ 21^m\ 30^s$ p.m., at 6404 feet. The Tyne was visible almost to its source.
At $6^h\ 27^m$ p.m., at 7790 feet. Newcastle seen.
At $6^h\ 33^m\ 30^s$ p.m., at 7690 feet. Wind was felt in our faces.
At $6^h\ 37^m\ 30^s$ p.m., at 6898 feet. Losing sight of the sun. Travelling along a line of railway in the direction of Durham. Wind gentle. Fields seen with sheaves of corn through a break in the clouds.
At $6^h\ 57^m\ 30^s$ p.m., at 1200 feet. Earth seen faintly; can see furnaces and tramways; Durham Minster in sight on a hill; Leanside Junction visible.
At $6^h\ 59^m$ p.m., at 840 feet. Going towards hills beyond Leanside.

September 29, 1863.

At 8^h 21^m a.m., at 8504 feet. Temperature of gas 29°·0 in the neck of balloon.

At 8^h 22^m 30^s a.m., at 8726 feet. No sun here; about 30 miles distant the sun is shining on the landscape, over a large space, which appears very bright in contrast with all around.

At 8^h 31^m a.m., at 1030 feet. The earth looks like a beautiful garden at places from 20 to 30 miles distant, upon which the sun is shining brightly.

At 8^h 40^m a.m., at 11,592 feet. Passing a large town; query, Nottingham or Ashby-de-la-Zouch.

At 8^h 42^m a.m., at 11,857 feet. Ice on water.

At 8^h 44^m a.m., at 12,305 feet. Moving straight for the Wash.

At 8^h 57^m a.m., at 12,704 feet. A beautiful tinge of blue.

At 9^h a.m., at 12,926 feet. Smoke streaming up to a height of about 1½ mile.

At 9^h 1^m 30^s a.m., at 12,926 feet. Examined the balloon internally for holes or rents; the dome of the balloon appeared greatly increased in size; does looking through gas enlarge objects?

At 9^h 12^m a.m., at 13,882 feet. The air is nearly saturated.

At 9^h 29^m a.m., at 13,982 feet. Filled bag with air.

At 9^h 32^m a.m., at 16,284 feet. Filled another bag with air.

At 9^h 43^m a.m., at 13,897 feet. A beautiful ring on the blackened bulb of hygrometer. Packed up dry and wet thermometers.

At 9^h 47^m a.m., at 14,155 feet. Can see 50 miles of coast well.

At 10^h 9^m a.m., at 7396 feet. Sun warm.

October 9, 1863.

At 4^h 30^m 30^s p.m., at 899 feet. Very rapid decline of temperature.

At 4^h 32^m 30^s p.m., at 2279 feet. A golden sunset, colours very intense.

At 4^h 35^m 30^s p.m., at 4111 feet. Temperature again falling quickly.

At 4^h 36^m p.m., at 4219 feet. The Thames visible to its mouth.

At 4^h 37^m 30^s p.m., at 5672 feet. The sea beyond the mouth of the Thames visible.

At 4^h 39^m 30^s p.m., at 6277 feet. Over London.

At 4^h 41^m p.m., at 6732 feet. The river Thames like a canal.

At 4^h 41^m 30^s p.m., at 6796 feet. London looks very fine indeed.

At 4^h 44^m p.m., at 7193 feet. The sunset is gorgeous.

At 4^h 45^m p.m., at 7252 feet. The ships in the Thames appear long and narrow, and steamboats like moving toys.

At 4^h 46^m p.m., at 7303 feet. The docks distinct and very clear.

At 4^h 46^m 30^s p.m., at 7310 feet. Can see the inner court of the Bank; St. Paul's Cathedral looks small; all streets in the city are distinctly visible; Milbank Prison and Oxford Street seen very clearly.

At 4^h 49^m p.m., at 6731 feet. Blue smoke of London curving upward; mist towards south of London bounded by a straight line.

At 4^h 52^m 45^s p.m., at 5433 feet. Leaving London.

At 5^h 55^m 10^s p.m., at 4302 feet. The wet thermometer reading is increasing more than the dry-bulb.

At 5^h 2^m p.m., at 3040 feet. Nearly over Tottenham.

At 5^h 4^m p.m., at 3087 feet. Beautiful golden sunset.

At 5^h 42^m 15^s p.m., at 2909 feet. A sudden dryness.

At 5^h 43^m p.m., at 3326 feet. Too dark to observe either Daniell's or Regnault's hygrometer.

At 5^h 57^m p.m., at 8416 feet. Not sure of decimals in thermometer readings.

At 6^h p.m., at 8714 feet. Could not read at all after this.

January 12, 1864.

At 2^h 6^m p.m., on ground. Great deposit on Regnault.

At 2^h 8^m 30^s p.m., at 368 feet. Over the river Thames.

At 2^h 14^m p.m., at 1773 feet. Crossing Tilbury; off the river.

At 2^h 15^m p.m., at 1787 feet. Crossing the line again.

At 2^h 21^m 30^s p.m., at 2735 feet. Crossing Hainault Forest; earth looks dull.

At 2^h 44^m p.m., at 6692 feet. Can see Chelmsford.

At 2^h 55^m p.m., at 7666 feet. Can see Blackwater; estimated distance from the coast 10 miles.

At 3^h 11^m p.m., at 9105 feet. Applied water to wet-bulb thermometer.

At 3^h 14^m p.m., at 9437 feet. On a level with Harwich or Colchester.

At 3^h 21^m 40^s p.m., at 10,319 feet. Query over Newmarket.

At 3^h 35^m p.m., at 11,353 feet. Rabbits heavy and dull.

At 3^h 36^m 30^s p.m., at 10,879 feet. Dog whining.

At 4^h p.m., at 3384 feet. Applied water to wet-bulb thermometer; forest of pines visible.

April 6, 1864.

At 4^h 16^m p.m., at 2775 feet. Over the edge of the river on the Essex side.

At 4^h 18^m p.m., at 3507 feet. The goat uneasy.

At 4^h 20^m 30^s p.m., at 4404 feet. Goat less uneasy.

At 4^h 23^m p.m., at 5251 feet. Can see a very large oval in the cloud, with balloon in the centre; no prismatic colours.

At 4^h 26^m 30^s p.m., at 6627 feet. Immense halo upon the clouds.

At 6^h 37^m p.m., at 11,075 feet. A rent in the balloon very high up.

June 13, 1864.

At 7^h 1^m 30^s p.m., at 1155 feet. Apparently going over the Isle of Dogs.

At 7^h 5^m p.m., at 2282 feet. Sun on the water dazzling in the direction of London.

At 7^h 15^m p.m., at 2694 feet. In a line with Charlton.

At 7^h 18^m p.m., at 3234 feet. In a line with Woolwich.

At 7^h 31^m p.m., at 3517 feet. Erith Church nearly under us.

At 7^h 36^m 51^s p.m., at 2602 feet. Over the edge of the river bank.

At 7^h 38^m 36^s p.m., at 2813 feet. Over the edge of the river bank on the Essex side: therefore 1^m 45^s was the time occupied in crossing the river.

June 20, 1864.

At 6^h 18^m p.m., at 772 feet. Passing over Derby.

At 6^h 19^m p.m., at 1462 feet. Over the Derwent.

At 6^h 36^m 40^s p.m., at 2740 feet. Can see Nottingham.

At 6^h 41^m p.m., at 3050 feet. Nottingham race-course and Burford seen; moving towards Sherwood Forest.

At 6^h 57^m p.m., at 3360 feet. Over Nottingham and Lincoln Railway.

June 27, 1864.

At 6^h 37^m p.m., at 865 feet. Over Penge.
At 6^h 38^m p.m., at 970 feet. Going nearly towards Bromley.
At 6^h 38^m 30^s p.m., at 1054 feet. Over Chatham and Dover line of railway.
At 6^h 48^m p.m., at 840 feet. Over Shortlands.
At 6^h 48^m 30^s p.m., at 750 feet. Can see the fountains playing at the Crystal Palace.
At 6^h 49^m 30^s p.m., at 713 feet. Can see the new church at Bromley.
At 6^h 50^m p.m., at 846 feet. Passing south of Bromley.
At 6^h 53^m p.m., at 1309 feet. Going over Hayes Common.
At 7^h 3^m p.m., at 1460 feet. Passing down the Sevenoaks road.
At 7^h 18^m p.m., at 4840 feet. Golden tinge over the water.
At 7^h 26^m p.m., at 3322 feet. Sun shining on black-bulb thermometer.
At 7^h 26^m 30^s p.m., at 3302 feet. Can see Farningham; passing Madamscourt Hill.
At 7^h 34^m 30^s p.m., at 3734 feet. Crossing Sevenoaks line.
At 7^h 35^m p.m., at 3907 feet. Can see Knoll House.
At 7^h 45^m p.m., at 4699 feet. Passing to the left of Tunbridge.
At 7^h 54^m p.m., at 3958 feet. Near village of Hadlow.
At 7^h 56^m 30^s p.m., at 3936 feet. Nearly over the Medway.
At 8^h 0^m 30^s p.m., at 3450 feet. Can see main line of South-eastern Railway.
At 8^h 3^m p.m., at 3044 feet. Belt across the sun visible, apparently on our level.
At 8^h 3^m 30^s p.m., at 2994 feet. Can see two horses, and a man leading them.
At 8^h 17^m p.m., at 3444 feet. Going over Goudhurst.
At 8^h 22^m 30^s p.m., at 2828 feet. Passing between Hawkhurst and Cranbrook.
At 8^h 28^m 20^s p.m., at 2221 feet. Cranbrook very distinct.
At 8^h 32^m p.m., at 1831 feet. The country is very beautiful.
At 8^h 36^m p.m., at 2208 feet. Over Tenterden.
At 9^h 8^m p.m., at 6168 feet. Could not see to read the instruments after this time.

August 29, 1864.

At 4^h 14^m p.m., at 4612 feet. Balloon revolving once in three minutes.
At 4^h 28^m 30^s p.m., at 8224 feet. Ships appear very small.
At 4^h 36^m p.m., at 10,875 feet. The fountains at the Crystal Palace look very small.
At 4^h 57^m p.m., at 13,991 feet. Nearly over Erith.
At 5^h 17^m 30^s p.m., at 6558 feet. Over the edge of the river bank.

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on August 31, 1863.

NEWCASTLE-ON-TYNE.

Time of observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
9 0 a.m.	29·708	49·5	47·5	45·3	·303	86	N.E. by N.	...	...	Dull. Thunder with heavy rain at 8 p.m. and afternoon.
3 0 p.m.	29·698	60·0	58·5	57·2	·469	91	N.E. by N.	...	...	
6 0 "	29·720	57·5	55·2	53·2	·406	89	......	...	...	
9 0 "	29·742	55·0	52·0	49·1	·349	81	N.W. by N.	...	...	Dull.

September 29, 1863.

WROTTESLEY OBSERVATORY.

Time of observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
7 30 a.m.	29·456	43·0	42·6	42·1	·268	97	S.	9·0	...	Fine. Between 7^h 45^m a.m. and 10^h 30^m a.m. 33 miles of air passed over the observatory according to the anemometer.
7 40 "	29·453	43·0	42·7	42·3	·270	98	S.			
7 50 "	29·457	43·8	43·0	43·0	·277	100	S.			
8 0 "	29·458	44·0	43·5	42·9	·276	96	S.			
8 10 "	29·458	44·5	43·9	43·4	·281	96	S.	8·0	...	
8 20 "	29·458	45·0	44·4	43·7	·285	89	S.			
8 30 "	29·455	46·0	45·0	43·9	·287	93	S.			
8 40 "	29·454	46·8	45·7	44·4	·293	92	S.	5·0	...	
8 50 "	29·454	47·1	46·0	44·8	·297	92	S.			
9 0 "	29·455	48·0	46·9	45·6	·306	92	S.			
9 10 "	29·455	48·1	46·7	45·1	·301	90	S.	9·0	...	
9 20 "	29·456	47·9	46·5	44·9	·298	93	S.			
9 30 "	29·454	48·4	46·9	45·2	·302	89	S.			
9 40 "	29·453	49·4	47·9	46·2	·313	90	S.	7·5	...	
9 50 "	29·450	50·0	48·0	45·9	·309	86	S.			
10 0 "	29·456	50·1	47·9	45·6	·306	85	S.S.W.	6·0	...	
10 10 "	29·450	51·4	49·0	46·5	·317	84	S.S.W.			
10 20 "	29·451	51·2	49·0	46·7	·319	85	S.S.W.			
10 30 "	29·457	52·0	49·2	46·3	31·5	81	S.S.W.	6·0	...	
10 40 "	29·454	52·8	49·7	46·6	31·8	80	S.S.W.			
10 50 "	29·459	52·8	49·0	45·2	30·2	76	S.S.W.			

September 29, 1863.

BEESTON OBSERVATORY.

Time of observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
9 45 a.m.	29·989	55·6	52·2	48·9	·346	79	S.W. by S.	2·2	...	The weather very fine. In the W. and N. much wild cumulus and cirri coming up and moving rapidly in W.S.W. currents, and very high cirri in N. current, some low cirri rapidly in N.E. currents. The sky in S. to E., from zenith
10 0 "	29·988	55·5	52·1	48·9	·346	82	S.W. by S.	2·0	...	
10 15 "	29·988	55·0	51·7	48·6	·343	79	S.W. by S.	2·7	...	

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

September 29, 1863 (*continued.*)

BEESTON OBSERVATORY (*continued*).

Time of observation.	Reading of Barom. reduced to 32° F.	Thermom. Dry.	Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
										to horizon, cloudless, except two or three small hemispherical cumuli; sky clear and brilliant; distant hills hazy. The wind became S.W. by S. at 5^h, and in which quarter it remained (moving in oscillations from S.W. to S.S.W. till 3^h 3^m p.m., when it was S.S.E. for 5 minutes, after which it became stationary in the W.S.W. all day).
10 30 a.m.	29·988	54·7	51·6	48·7	·344	80	s.w. by s.	5·0	...	The weather fine, but clouds moving in W.S.W., N.E., and N. currents.
10 45 „	29·984	54·5	51·6	48·8	·345	80	s.w. by s.	5·5	...	The weather fine.
11 0 „	29·984	54·5	51·5	48·6	·343	80	s.w. by s.	3·0	...	
11 30 „	29·980	55·0	51·8	48·8	·345	80	s.w. by s.	3·0	...	
12 30 p.m.	29·977	55·7	51·7	48·0	·335	75	s.w. by s.	9·0	...	Nearly overcast; brisk wind; cumulostrati.
3 0 „	29·931	56·3	52·2	48·4	·346	74	s.w. by s.	2·0	...	The weather very fine.

October 9, 1863.

ROYAL OBSERVATORY, GREENWICH.

Time of observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
3 0 p.m.	29·409	57·6	51·7	46·4	·316	67	S.S.E.	2	...	Some patches of cumulus and cirrus scattered over the sky.
3 15 „	29·408	57·6	52·0	46·9	·322	68	S.S.E.	4	...	Cumulus, cirrus, and a few cirrostratus clouds.
3 30 „	29·408	57·2	51·0	45·3	·303	64	S.S.E.	3	...	Cirrus, cumulus, and cirrostratus.
3 45 „	29·407	57·0	50·7	45·0	·299	64	S.S.E.	4	...	
4 0 „	29·405	55·7	50·5	45·6	·306	69	S.S.E.	3	...	Cirrus, cirrocumulus, cumulostratus.
4 15 „	29·405	54·8	49·7	44·8	·297	69	S.S.E.	2	...	
4 30 „	29·406	53·4	49·3	45·2	·302	74	S.S.E.	0	...	Sky is nearly cloudless; a little light cloud in the S.W. and W.
4 45 „	29·407	52·6	48·7	44·8	·297	75	S.S.E.	1	...	Light clouds in the N.E. and S.W.
5 0 „	29·408	51·3	48·2	45·0	·299	79	S.S.E.	1	...	Balloon first seen at 4^h 55^m N. of the River Thames.
5 15 „	29·408	50·4	47·7	44·8	·297	82	S.E.	1	...	Clear southward; hazy in the N. Balloon seen bearing N.N.W.; moving northwards.
5 30 „	29·410	49·8	46·8	43·6	·284	78	S.E.	0	...	A few light clouds in N.E.; hazy in N.; cirrostratus generally round the horizon.
5 45 „	29·414	48·9	46·5	43·9	·287	86	E.S.E.	0	...	Cirrostratus near the horizon, but of no numerical value; hazy in the N. Balloon disappeared at 5^h 27^m.
6 0 „	29·414	48·4	46·4	44·2	·290	86	E.S.E.	0	...	Cloudless.
6 30 „	29·414	48·4	46·8	45·0	·299	89	E.	0	...	

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

January 12, 1864.—ROYAL OBSERVATORY, GREENWICH.

Time of observation.	Reading of Barom. reduced to 32° F.	Thermom. Dry.	Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
2 0 p.m.	29·962	40·7	38·4	35·8	·210	84	S.S.E.	10	...	Overcast; cirrostratus.
2 15 „	29·961	40·1	38·4	36·2	·214	86	S.S.E.	10	...	
2 30 „	29·961	39·9	38·2	36·0	·212	87	S.S.E.	10	...	
2 45 „	29·964	39·8	38·2	36·1	·213	87	S.S.E.	10	...	
3 0 „	29·973	39·7	38·1	36·0	·212	87	S.S.E.	10	...	
3 15 „	29·978	39·1	37·7	35·9	·211	89	S.S.E.	10	...	
3 30 „	29·980	38·6	37·2	35·4	·207	89	S.S.E.	10	...	
3 45 „	29·983	38·6	37·3	35·6	·208	90	S.S.E.	10	...	
4 0 „	29·985	38·6	37·3	35·6	·208	89	S.S.E.	10	...	
4 15 „	29·986	38·6	37·3	35·6	·208	89	S.S.E.	10	...	
4 30 „	29·986	38·3	37·2	35·2	·205	89	S.S.E.	10	...	
4 45 „	29·989	38·2	37·0	35·3	·206	90	S.S.E.	10	...	
5 0 „	29·998	38·7	37·2	35·7	·209	90	S.S.E.	10	...	

April 6, 1864.

ROYAL OBSERVATORY, GREENWICH.

Time of observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
2 0 p.m.	30·070	44·8	41·8	38·2	·231	78	N.N E.	10	0	Overcast; a few drops of fine rain at 4^h 20^m.
2 15 „	30·070	45·0	42·3	39·1	·238	64	N.N.E.	10	0	
2 30 „	30·069	44·9	42·1	38·8	·236	80	N.N.E.	10	0	
2 45 „	30·065	44·9	42·1	38·8	·236	80	N.N.E.	10	0	
3 0 „	30·056	45·0	42·2	38·9	·237	79	N.N.E.	10	0	
3 15 „	30·056	44·7	41·8	38·3	·231	79	N.N.E.	10	0	
3 30 „	30·057	45·0	42·2	38·9	·237	79	N.N.E.	10	0	
3 45 „	30·056	44·9	42·0	38·6	·234	80	N.N.E.	10	0	
4 0 „	30·055	45·0	42·3	39·1	·238	76	N.N.E.	10	0	
4 15 „	30·057	44·8	42·1	38·9	·237	80	N.N.E.	10	0	
4 30 „	30·055	45·1	42·1	38·6	·234	79	N.N.E.	10	0	
4 45 „	30·055	45·6	42·6	39·0	·238	79	N.N.E.	10	0	
5 0 „	30·053	44·8	41·5	37·8	·227	76	N.N.E.	10	0	
5 15 „	30·053	44·7	41·4	37·5	·225	76	N.N.E.	10	2	
5 30 „	30·054	44·3	41·2	37·6	·227	77	N.N.E.	10	2	
5 45 „	30·054	44·2	41·6	38·5	·233	80	N.N.E.	10	2	
6 0 „	30·054	44·1	41·5	38·4	·232	80	N.N.E.	10	2	

June 13, 1864.

ROYAL OBSERVATORY, GREENWICH.

Time of observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
6 0 p.m.	29·476	61·9	52·3	44·0	·288	52	......	0	...	Sky cloudless, excepting a small patch of cirrocumulus in the N.E.
7 0 „	29·480	59·0	52·2	46·2	·313	62	......	0	...	Balloon seen at 7^h 7^m moving due E.
7 15 „	29·481	58·2	52·0	46·2	·313	65	......	0	...	Cloudless. Balloon still rapidly moving to the E., veering in a slight degree to the S.
7 30 „	29·484	57·2	51·2	45·7	·307	65	......	0	...	Cloudless. Balloon last seen at 7^h 23^m.
7 45 „	29·486	56·5	50·7	45·4	·304	67	......	0	...	Cloudless.
8 0 „	29·487	55·9	49·5	45·5	·305	64	......	0	...	
8 15 „	29·488	54·9	48·6	42·6	·273	64	......	0	...	
8 30 „	29·498	53·1	48·4	42·9	·276	70	......	0	...	
8 45 „	29·498	52·8	48·2	43·6	·284	71	......	0	...	
9 0 „	29·499	52·8	48·2	43·6	·284	71	......	0	...	

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

June 20, 1864.

Beeston Observatory.

Time of observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
4 35 p.m.	29·949	68·0	60·1	53·9	·416	60	...	10		
4 40 „	29·949	68·0	60·1	53·9	·416	60	...	10		
4 45 „	29·947	68·0	60·1	53·9	·416	60	...	10		
4 50 „	29·947	67·7	60·0	53·9	·416	61	...	10		
4 55 „	29·946	67·6	60·1	54·2	·421	62	...	9		
5 0 „	29·945	67·4	59·9	54·1	·419	62	...	8		
5 5 „	29·943	67·2	59·8	54·1	·419	62	...	6	...	Considerable breaks in the clouds.
5 10 „	29·943	67·0	60·0	54·4	·424	64	...	7		
5 15 „	29·944	66·7	59·8	54·2	·421	64	...	7		
5 20 „	29·939	66·3	59·7	54·3	·422	66	...	7		
5 25 „	29·941	66·0	59·6	54·3	·422	66	...	7		
5 30 „	29·941	65·6	59·5	54·5	·425	69	...	7		
5 35 „	29·941	65·3	59·2	54·2	·421	68	...	7		
5 40 „	29·941	65·7	59·6	54·5	·425	68	...	8		
5 45 „	29·941	66·0	59·7	54·2	·421	67	...	8		
5 50 „	29·939	66·3	59·8	54·5	·425	66	...	9		
5 55 „	29·939	66·3	59·8	54·5	·425	66	...	9		
6 0 „	29·941	66·1	59·7	54·1	·419	67	...	9		
6 5 „	29·940	66·0	59·5	54·2	·421	66	...	9		
6 10 „	29·940	65·7	59·3	54·0	·418	67	...	9		
6 15 „	29·938	65·7	59·3	54·0	·418	67	...	10		
6 20 „	29·938	65·5	59·2	54·0	·418	67	...	10		
6 25 „	29·937	65·3	59·1	54·1	·419	68	...	10		
6 30 „	29·938	65·0	59·0	54·1	·419	68	...	10	...	At $6^h\ 29^m$ the balloon was exactly opposite this observatory (Beeston), a.m.
6 35 „	29·933	64·7	58·9	54·0	·418	69	...	10	...	At $6^h\ 33^m$ sand thrown out and the balloon rose 2°.
6 40 „	29·930	64·7	58·6	53·4	·409	67	...	10	...	At $6^h\ 38^m$ balloon exactly over Wollaston Hall, altitude 25°.
6 45 „	29·929	64·7	58·4	52·7	·399	66	...	10	...	At $0^h\ 41^m$ balloon disappeared in clouds in the N.N.E.
6 50 „	29·929	64·7	58·4	52·7	·399	66	...	10		
6 55 „	29·927	64·8	58·4	53·1	·404	66	...	10		
7 0 „	29·925	64·8	58·4	53·1	·404	66	...	10		
7 5 „	29·921	64·6	58·3	53·0	·403	67	...	10		
7 10 „	29·921	64·6	58·2	52·8	·400	66	...	10		
7 15 „	29·919	64·3	58·2	52·9	·401	66	...	10		
7 20 „	29·919	64·1	58·1	53·1	·404	72	...	10		
7 25 „	29·917	64·0	58·1	53·2	·406	68	...	10		
7 30 „	29·918	63·8	58·0	53·2	·406	70	...	9		
8 30 „	29·918	63·0	57·4	52·6	·397	69	...	9		
9 0 „	29·913	62·4	57·5	53·2	·406	73	...	9		
9 30 „	29·899	62·0	57·5	53·7	·413	74	...	9		
10 10 „	29·882	61·7	57·1	53·0	·403	74	...	9		

Meteorological Observations made at different Stations in connexion with the Balloon Ascent on

June 27, 1864.—Blackheath.

Time of observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
6 15 p.m.	30·045	60·4	53·7	47·9	·334	63	W.S.W.	9	...	Nearly overcast.
6 30 „	30·045	60·0	52·8	46·4	·316	61	......	7	...	Blue increasing above, cumuli surrounding.
6 40 „	30·045	60·0	52·6	46·0	·311	60	......	9	...	Cumuli and cumulostratus in the east.
6 50 „	30·045	60·0	52·5	45·9	·309	60	......	9	...	
7 0 „	30·045	60·1	53·1	46·8	·321	62	......	7		
7 10 „	30·045	60·0	52·5	45·9	·309	60	......	7		
7 20 „	30·046	59·1	52·2	46·1	·312	62	......	5	...	Zenith clear; cumuli all round.
7 30 „	30·046	58·5	52·5	47·2	·325	66	......	3		
7 40 „	30·040	58·3	52·0	46·4	·316	65	......	5		
7 50 „	30·037	58·2	52·1	46·7	·319	66	......	6	...	Cumulus and cirrocumulus.
8 0 „	30·035	58·2	52·3	47·0	·323	67	......	6	...	
8 10 „	30·028	57·9	52·0	46·7	·319	67	......	7	...	
8 20 „	30·028	57·4	51·8	46·8	·321	67	......	8	...	Zenith particularly clear.
8 30 „	30·028	56·5	51·7	47·4	·328	72	......	3	...	Zenith perfectly clear; clouds in N.
8 40 „	30·028	56·1	51·0	46·2	·313	70	......	5	...	Cumulus and cirrocumulus in the zenith; cumulus in the N.; cumulostratus in the E., and clear in the S. and S.E.
8 50 „	30·027	...	...	...	...	...	......	...	...	

August 29, 1864.

Royal Observatory, Greenwich.

Time of observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
3 0 p.m.	29·877	77·5	62·1	51·4	·379	40	S.W.	5	0	Light high cirrus.
3 15 „	29·877	77·0	61·7	51·0	·374	40	S.W.	5	...	
3 30 „	29·877	75·5	61·6	51·6	·382	44	S.W.	5	...	
3 45 „	29·879	74·7	61·4	51·8	·385	45	S.S.W.	5	...	
4 0 „	29·879	73·8	60·3	50·4	·366	44	S.W.	5	0	
4 6 10^s	......	...	...	...	...	...	......	...	...	Balloon seen to rise from the Crystal Palace grounds.
4 15 „	29·881	73·4	59·7	49·7	·357	43	S.S.W.	5		
4 30 „	29·873	72·4	58·5	48·1	·366	43	S.S.W.	5		
4 40 „	......	...	...	...	...	...	......	...	...	Estimated place of balloon S. of Woolwich.
4 45 „	29·873	72·0	57·6	46·8	·321	41	S.S.W.	4		
5 0 „	29·870	71·0	57·5	47·2	·325	42	S.S.W.	3	0	
5 1 „	......	...	...	...	...	...	......	...	...	Through a 30-in. achromatic telescope, the several parts of the grapnel, connecting-rope, netting, &c. could be distinctly seen; and Mr. Glaisher could also be seen at one end of the car (probable distance from Greenwich 8 miles). From $5^h\ 1^m$ to $5^h\ 6^m$+. The balloon rotated in the direction S.W., N.E., in $5\frac{1}{2}^m$.
5 7 „	......	...	...	...	...	...	......	...	...	Sand was thrown out several times from $5^h\ 7^m$ to $5^h\ 12^m$. Another revolution of balloon S.W., N.E., in 5^m.

Meteorological Observations made at different Stations in connexion with the Balloon Ascent in

August 29, 1864 (*continued*).—Royal Observatory, Greenwich.

Time of observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone	Remarks.
h m	in.	°	°	°	in.					
1 12 p.m.	......	...	...	...	...	...	......	...	...	Grapnel still visible, but connecting-rope not distinguished.
5 15 ,,	29·869	69·9	58·3	49·4	·353	48	S.S.W.	3	...	Sand thrown out.
5 17 ,,	......	...	...	...	...	...	......	...	...	Mr. Coxwell visible in ring.
5 22 ,,	......	...	...	...	...	...	......	...	...	Balloon descending; gas being let off rapidly; balloon quite flaccid.
5 27 ,,	......	...	...	...	...	...	......	...	...	Moving northwards; still seen through mist, apparently over Essex Marshes, far beyond North Woolwich.
5 30 ,,	29·871	69·6	58·1	49·3	·352	49	S.S.W.	2	...	The zenith is almost entirely free from clouds.
5 31 ,,	......	...	...	...	...	...	......	...	...	Balloon down; grapnel caught; balloon jerked over. The place of descent was observed to be not far from the Essex bank of the river, and was estimated near Purfleet, or perhaps further on near bank opposite to Northfleet.
5 45 ,,	29·875	68·6	57·5	48·8	·345	49	S.S.W.	1	...	Light clouds near horizon.
6 0 ,,	29·875	67·5	57·0	48·7	·344	50	S.S.W.	0	0	Cloudless, with the exception of a few light clouds in the S. and S.E.

August 29, 1864.—Blackheath.

Time of observation.	Barom.	Dry.	Wet.	Dew-point.	Tension of vapour.	Humidity.	Wind.	Cloud.	Ozone.	Remarks.
1 0 p.m.	29·944	71·1	58·4	48·7	·344	45	W. by S.	7	...	Cirrus, cumulus, cirrostratus, and cumulostratus.
2 0 ,,	29·950	74·6	62·9	54·5	·425	50	W. by S.	3	0	Cumulus and cirrostratus in horizon; clear in zenith.
2 30 ,,	29·950	74·1	62·6	54·1	·419	50	W.	3	...	Detached cirrocumulus and cirrostratus; clear in zenith.
3 0 ,,	29·950	73·6	62·1	53·7	·413	50	W.	3	0	Clear in zenith; cirrocumulus in horizon.
3 10 ,,	29·950	73·0	61·1	52·3	·393	48	W. by S.	4	...	Clear in zenith, with the exception of a cirrocumulus cloud.
3 20 ,	29·950	73·6	61·3	52·4	·394	48	W. by S.	4	...	
3 30 ,,	29·950	73·1	61·0	52·0	·388	48	S.W.	4	...	Cirrostratus and cumul[illegible]
3 40 ,,	29·950	72·6	60·7	51·8	·385	48	S.W.	4	...	
3 50 ,,	29·950	72·2	60·5	51·8	·385	49	S.W.	5	...	
4 0 ,,	29·950	71·8	60·3	51·6	·382	49	S.W.	7	0	Cirrostratus and cirrocumulus.
4 10 ,,	29·950	71·0	60·0	51·6	·382	50	S.W.	4	...	
4 20 ,,	29·950	70·9	60·0	51·6	·382	50	S.S.W.	4	...	
4 30 ,,	29·950	70·8	59·0	49·8	·358	48	S.S.W.	3	...	
4 40 ,,	29·950	70·7	59·2	50·2	·364	48	S.S.W.	2	...	Cirrus in horizon.
4 50 ,,	29·950	70·4	59·4	51·0	·374	50	S.S.W.	2	...	
5 0 ,,	29·940	70·2	59·5	51·2	·377	51	S.S.W.	2	0	
5 10 ,,	29·940	69·9	59·4	51·3	·378	52	S.S.W.	2	...	Clear above; cirrostratus in the horizon.
5 20 ,,	29·940	68·8	59·0	51·3	·378	53	S.S.W.	2	...	
5 30 ,,	29·940	68·6	59·0	51·5	·381	54	S.S.W.	0	...	A few light cirrus clouds in horizon.
5 40 ,,	29·940	68·5	59·0	51·5	·381	54	S.S.W. by S.	0	...	
5 50 ,,	29·940	68·0	58·3	50·7	·370	53	S.S.W. by S.	0	...	
6 0 ,,	29·940	67·5	58·0	50·4	·366	54	S.S.W. by S.	0	...	Sky looks misty.

C

[*From the* Report *of the* British Association *for the* Advancement *of* Science *for* 1865.]

AN ACCOUNT

OF

METEOROLOGICAL AND PHYSICAL OBSERVATIONS

MADE IN

THREE BALLOON ASCENTS IN THE YEARS 1864 AND 1865

(IN CONTINUATION OF TWENTY-TWO MADE IN THE YEARS 1862, 1863, AND 1864).

BY

JAMES GLAISHER, F.R.S., &c.

An Account of Meteorological and Physical Observations in Three Balloon Ascents made in the years 1864 *and* 1865 (*in continuation of twenty-two made in the years* 1862, 1863, *and* 1864), *under the auspices of the Committee of the British Association for the Advancement of Science, by* James Glaisher, *F.R.S., at the request of the Committee, consisting of Colonel Sykes, the Astronomer Royal, Lord Wrottesley, Sir D. Brewster, Sir J. Herschel, Bart., Dr. Lloyd, Dr. Lee, Dr. Robinson, Mr. Gassiot, Mr. Glaisher, Prof. Tyndall, Dr. Fairbairn, and Dr. W. A. Miller.*

The Committee on Balloon Experiments was reappointed last year, chiefly for the following purposes :—

1st. To examine the electrical condition of the air, if possible.

2nd. To verify the law of the decrease of temperature as found from summer-day observations, already made, with day observations at other seasons of the year, but principally in the winter and adjacent months.

3rd. It was understood that, in addition, magnetical experiments, whenever possible, were to be made in preference to all others; observations by the spectroscope (particularly on the solar spectrum), on the currents of the atmosphere, on solar radiation at different heights, and hygrometical observations, though secondary, were to be held very important subjects of investigation, and to be followed as far as possible, according to circumstances.

4th. To make arrangements for observations at night, and to make observations at night, if possible.

With respect to the first of these objects, no further progress has been made; the instrument which was prepared last year, was prepared for use with an open-burning flame; this is not admissible with gas in such close proximity; and since the last Meeting I have been in hopes that Mr. Fleeming Jenkin, with Mr. Varley and Prof. Thomson, would be able to arrange an apparatus that might with safety be used; but, owing to engagements in connexion with the Atlantic Telegraph Cable, these gentlemen have not yet succeeded.

With respect to the second and third objects of research, some progress has been made, though not to the extent contemplated at the beginning of the year.

With respect to the fourth object, having relation to night observations, none have actually been made, but some arrangements have been completed, of which I will say a few words.

To take observations in the air at night, it is imperatively necessary to have some power of illumination, so that the instruments can be read.

Very many suggestions have been made for the benefit of the occupants of the car; among them phosphorus and the use of glow-worms have been mentioned. The latter I feared would lose their luminosity at a low temperature. The best of all seemed, however, to be a well-made miners' Davy-lamp; and through the kindness of my friends T. Sopwith, Esq., F.R.S., and E. Potter, Esq., of Tynemouth, two have been most carefully made by Mr. H. Watson, of Newcastle, of copper; so that their presence near to magnets is innocuous.

These lamps, with their lights burning, have been placed in a volume of gas, completely surrounded by it, without any bad effect following the immersion; and what is more important, I have had one of these lamps burning during an ascent made on the 27th of February of this year, coming down alight—the only difference between with and without the light being that in the latter case I had a source of heat to warm my cold fingers, which I never had before.

I consider that at present all necessary arrangements have been made for night observations, so far as light is concerned; and I cannot but regard this as an advance, although I have not any results to present of observations made at night, and we therefore are still in utter ignorance, without a single observation of the processes in operation at night to guide us, at any distance from the earth. Such a series of observations, even though only to the height of half a mile, would be very valuable indeed.

§ 1. Instruments and Apparatus.

The instruments used were for the most part the same in construction as those in the preceding year; in addition, however, to them, there was a very fine spectroscope by Mr. Browning, and a delicately mounted magnet lent by Capt. Evans, F.R.S.

§ 2. Observing-Arrangements.

The instruments were in all cases placed on suitable framework attached to the outside of the car, and were in this position easily read by myself standing at the end of the car.

Circumstances of the Ascents, and General Observations.

Up to the last Meeting of the Association there had been 22 ascents, of which 17 had been made in the months of June, July, August, and September, and 5 only in the other months of the year, viz. 1 in January, 1 in March, 2 in April, and 1 in October. Of those made in the summer months, one only had been made in the morning, and 16 had been made in the afternoon or evening, with a declining sun.

Efforts were therefore directed to day experiments between the months of October and April, it being considered that the day and high experiments in summer already collected had better be brought together and discussed before any more of such experiments were made, and that in future attention should be directed to those points of research needing further elucidation.

I therefore devoted all my leisure between the months of October and April to securing as many ascents as I could between these times, and regret to say that I succeeded in three only. The first of these was on December 1st, the second on December 30th, 1864, and the third on February 27th of the present year. These three ascents were made from Woolwich Arsenal.

Although I have so few ascents to speak of, it must be borne in mind that winter is the most difficult season of the year to pursue balloon experiments; yet as mountains are not climbed at this time of the year, and so few experiments have hitherto been made by means of the balloon, we are in almost entire ignorance of everything connected with the higher regions of the atmosphere during this cold portion of our year, in respect to the progressive diminution of temperature with elevation, the diffusion of vapour in the atmosphere, the density of clouds, their extent, and the currents in the atmosphere.

It is therefore the most important season for experiments; and these will be exceeded in value only by night experiments.

Ascent from Woolwich Arsenal, December 1, 1864.—The balloon left the earth at 2^{h} 37^{m} p.m., the temperature of the air at the time being 48°; and this value remained almost unchanged till the height of 600 feet was passed (increasing slightly in fact at first), and then very gradually declined to $31\frac{1}{2}$° at about one mile in height.

Ascent from Woolwich Arsenal, December 30, 1864.—The balloon left at 2^{h} 13^{m} p.m., with a temperature at the time of $42\frac{1}{2}$°; it declined 2° in the first 500 feet; at 1000 feet high it was 37°, or showing a decrease of $5\frac{1}{2}$°; at 2000 feet it was $33\frac{1}{2}$°, showing a further decline of $3\frac{1}{2}$° in this 1000 feet. At 2500 feet high we met with cloud; the temperature was 31°. At 3300 feet, just at the upper surface of the cloud, the temperature was 27°; on getting above the cloud the temperature rose, and when 400 feet above it had increased to $31\frac{1}{2}$°.

Ascent from Woolwich Arsenal, on February 27, 1865.—We left the earth at 1^{h} 58^{m} p.m.; the temperature of the air was 52°, declined gradually to 35°, when cloud was reached, which proved to be 1000 feet in thickness; during the passage through it there was no change of temperature, but on passing above it the temperature increased with the elevation.

By comparing these results with those taken in the period of summer they differ very greatly, and plainly show that *the laws of temperature holding good at one season are different from those at other seasons of the year.*

The balloon's courses in these three ascents were very nearly the same after attaining a certain elevation. On the 1st of December, on reaching 1100 feet, the current of air changed from W. to S.W.; at 2000 feet a W.N.W. current was entered; at 5000 feet the air was moving W.N.W., and we approached the sea, compelling us to descend near Rochester at 4^{h} 25^{m} p.m.

In the second ascent the wind was nearly south on the earth when the inflation began; it changed to W. nearly, and pilot balloons at a moderate elevation moved N.W. On leaving, the balloon first moved E.N.E.; when 500 feet high we entered a W. current, and, as before, moved towards the sea. It was at first intended to descend near the river Thames; but on coming within 300 feet of the earth the wind changed and we went somewhat inland, and descended, at 3^{h} 20^{m}, near to Stamford Le Hope.

During the month of January, and the greater part of February, as far as could be determined from daily observation from the Royal Observatory, Greenwich, the general prevalence of the wind in the higher regions of the air was W. and S.W. On February 27th the direction of the wind on the earth

was N., and apparently steady in that direction while the balloon was being filled. On its completion the wind had changed to the S., and 4 or 5 hours' observations were looked forward to.

On reaching the height of 1500 feet, the balloon again fell in with the prevalent S.W. current, and at 3000 feet was in a nearly W. current, and again passed over the like course, directly towards the sea. It was therefore not deemed prudent to ascend very high. When above the lower clouds they were seen moving at right angles to the balloon's motion. Approaching the sea, it was necessary to descend; and on again reaching the height of 3000 feet the balloon fell in with the S.W. current, at 1500 feet with the S. current, and with this passed somewhat inland; on again reaching 3000 feet, we turned to move again directly towards the sea, and descended at South Hanningfield at $4^{h}\ 1^{m}$.

After this I did not succeed in ascending, and since April I have mostly been taking steps towards securing some night ascents.

It is unfortunate, in one sense, that the wind on these occasions, notwithstanding its direction on the land, was so constantly at certain elevations moving with a W., W.S.W. or S.W. current, because on all occasions it so shortened the time of observation, and limited the elevation to such heights only that we were certain of being able to descend before reaching the sea.

Yet the fact is important, and very much so, as proving the constancy of the S.W. current during our winter months; for the evidence of such current is not merely confined to these three days only, but a continued watch was kept on the higher regions from the Royal Observatory, and whenever scud or cloud has been seen at the proper elevation, it has been found to be moving in that direction. The high temperature we experience in winter seems to be very much due to the prevalence of the warm current.

In these three ascents, Frederick John Evans, Esq., Staff Commander R.N., F.R.S., Superintendent of the Compass Department of Her Majesty's Navy, very kindly furnished me with a very delicate magnet, which he uses on board of iron ships and in the Compass Department.

This instrument vibrates in a little more than two seconds on the earth. In the ascent on December 1, I was able to take ten sets of vibrations; and notwithstanding the lower temperature of the higher regions, the time of vibration was lengthened.

In the ascent on December 30, the balloon was in a constant state of rotation, and I was unable to take any magnetic observations.

In the ascent on February 27, the same needle vibrated in 2·001 seconds on the earth, at the height of one mile vibrated in 2·277 seconds nearly. These results were confirmed by another magnet, somewhat less delicately mounted, its time of vibration being found to be longer at high elevations than on the earth. These results agree with those found at other times of the year.

The Lines in the Solar Spectrum.

At every opportunity I directed the spectroscope to the sun, and always saw a very fine spectrum, with very many lines, far greater in number than when viewed on the earth, and much better defined. The spectrum usually extended from A to far beyond H, the latter line being plainly made up of fine lines. I have never seen the spectrum of the sun, when viewed on the earth, nearly so brilliant as it always is on rising above the lower atmosphere, although I have examined the solar spectrum many hundreds of times on the finest days. The spectrum, when viewed from above, is perfect with a much narrower opening of the slit than it is on the ground, and consequently lines can be resolved clearly which cannot be seen from the earth.

A very delicate blackened-bulb thermometer, placed with its bulb near to the carefully screened bulb for temperature of the air, in the first of these three ascents, generally read the same as that for the temperature of the air, occasionally read lower, and never during the ascent read more than 1° in excess. The same results were observed in the ascent on December 30th. In the ascent on February 27 it generally read the same; but at times, when the sun was shining the brightest, it read from 2° to 3° higher than its shaded neighbour.

No tinge of ozone was shown on any test-paper spread freely about on the rigging in any of these journeys.

§ 3. Description of the Table of Observations.

All the meteorological observations taken during the ascents are contained in Table I.

Column 1 contains the times at which the observations were made. Column 2 contains observations of the siphon barometer corrected for temperature and index error. Column 3 contains the readings of the thermometer attached to the barometer. Column 4 contains the readings of an aneroid barometer. Column 5 contains the height above the level of the sea, as reduced from the barometric readings in column 2 on the days the siphon barometer was used, and from column 4 on other days, by the formula of Baily, checked at intervals by that of Laplace, which is as follows:—

$$Z=\log\left(\frac{h}{h'}\right)\times 60159\left(1+\frac{t+t'-64}{900}\right)\left(1+0{\cdot}002837\cos 2L\right)\left(1+\frac{z+52251}{20886900}\right),$$

where Z is the height required, and h, h', t and t' the height of the barometer, corrected for temperature, and the temperature of the air at the lower and upper stations respectively, L the latitude. The temperature of the air for the position of the balloon has been derived from the readings in column 10, when such have been taken, otherwise from column 6. Columns 6 to 9 contain the observations with the dry- and wet-bulb thermometers free, and the deduced dew-point. Column 10 contains the readings of a gridiron thermometer. Columns 11 to 14 contain the observations with the dry- and wet-bulb thermometers aspirated, and the deduced dew-point. Columns 15 and 16 contain the direct dew-point observations with Daniell's and Regnault's hygrometers. When numbers are entered in columns 15 and 16 with "no dew" affixed to them, it is meant that the temperature of the hygrometer has been lowered to the degree stated, but that no dew has been deposited. Column 17 contains the readings of a very delicate blackened-bulb thermometer fully exposed to the sun's rays.

The Astronomer Royal had observations made every ten minutes at the Royal Observatory, Greenwich, on the days of ascent, by Mr. Nash of the Magnetical and Meteorological Department.

The height of Greenwich barometer-cistern above the mean sea-level is 159 feet.

Table I. A.—Meteorological Observations made in the Twenty-third Balloon Ascent, from Woolwich Arsenal, December 1, 1864.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Attached Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Difference.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened-bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	11 35 0 p.m.	......	......	......	......	......	......	......	......	46·5							
(1)	....	......	......	30·15	......	46·2	43·5	2·7	40.4	......	......	......	......	......	40·2	......	56·0
	....	30·192	61·0														
(2)	1 15 0 „	......	......	......	......	46·8	43·2	3·6	39·1	46·8	......	......	......	......	40·0	......	56·0
(3)	2 30 0 „	30·063	50·0	30·10	ground.	48·0	44·2	3·8	40·0	48·0	......	......	......	......	40·0	40·0	
(4)	2 37 0 „	......	......	29·95	206	48·2	44·1	4·1	39·6	48·2							
	2 38 0 „	......	......	29·61	498	48·0	44·0	4·0	39·6								
(5)	2 38 30 „	......	......	29·38	644	47·5	43·2	4·3	38·5	48·0							
(6)	2 39 0 „	29·042	51·0	29·20	890	47·2	43·3	3·9	38·9	......	......	......	......	......	.....	......	47·0
(7)	2 40 0 „	......	......	28·85	1,230	46·0	42·0	4·0	37·4								
(8)	2 41 0 „	28·413	51·0	28·45	1,618	45·0	41·2	3·8	36·8	......	......	......	......	......	......	......	44·5
(9)	2 42 0 „	......*	......	28·23	1,831	43·5	40·2	3·3	36·3								
(10)	2 43 0 „	......	......	27·80	2,248	43·0	38·7	4·3	37·9								
	2 44 0 „	......	......	27·40	2,636	41·0	36·0	5·0	29·7								
	2 45 0 „	......	......	26·70	3,298	44·0	36·0	8·0	29·7								
(11)	2 46 0 „	26·426	47·0	26·42	3,570	39·5	34·9	4·6	28·6	......	......	......	......	......	......	......	40·0
	2 48 0 „	......	......	26·19	3,804	38·5	33·0	5·5	25·6								
	2 50 0 „	......	......	25·78	4,222	38·0	32·0	6·0	23·8	......	......	......	......	......	20·0		
	2 51 0 „	......	......	25·68	4,324	38·0	32·0	6·0	23·8	38·5	......	......	......	......	......	......	39·0
(12)	2 54 0 „	......	......	25·30	4,630	36·0	29·1	6·9	18·7								
(13)	2 55 0 „	25·110	47·0	25·19	4,742	35·0	28·5	6·5	15·5	......	......	......	......	......	......	......	35·5
(14)	2 57 0 „	......	......	24·90	5,038	33·0	26·1	6·9	12·5						[dew		
	2 58 0 „	......	......	24·70	5,328	31·5	26·1	5·4	12·2	......	......	......	......	......	17·0 no		
(15)	2 59 0 „	24·690	46·0	24·70	5,328	31·5	26·1	5·4	12·2						[dew		
	3 5 0 „	......	......	25·50	4,496	31·2	26·5	4·7	15·6	......	......	......	......	......	15·0 no	......	33·0
	3 6 0 „	......	......	......	......	......	......	......	......	35·0							
(16)	3 6 30 „	......	......	25·67	4,319	31·2	26·5	4·7	15·6								
	3 8 0 „	......	......	25·80	4,184	33·0	29·1	3·9	21·3								
(17)	3 9 0 „	......	......	25·85	4,128	33·5	29·8	3·7	21·9	......	......	......	......	......	......	......	29·5
	3 10 0 „	......	......	25·80	4,170	34·5	30·0	4·5	22·4						[dew		
	3 14 0 „	......	......	25·09	4,766	32·2	29·1	3·1	22·0	......	......	......	......	......	16·0 no	......	31·5
(18)	3 15 0 „	24·891	46·0	24·92	4,909	31·8	27·2	4·6	16·6						[dew		
(19)	3 17 0 „	......	......	24·90	4,951	31·0	27·1	3·9	16·5	......	......	......	......	......	19·0 no	......	31·0
(20)	3 23 0 „	......	......	24·78	5,052	30·2	25·1	5·1	9·1								
	3 24 0 „	......	......	24·72	5,122	29·8	25·0	4·8	9·8	......	......	......	......	......	......	......	30·0
(21)	3 26 0 „	......	......	24·70	5,197	30·2	25·1	5·1	8·9								
	3 27 0 „	......	......	25·00	4,931	30·2	25·2	5·0	8·9								
	3 32 0 „	......	......	25·50	4,489	31·5	28·1	3·4	9·6								
(22)	3 33 0 „	......	......	25·45	4,541	32·0	28·1	3·9	9·1								
(23)	3 34 0 „	......	......	25·20	4,805	32·0	28·1	3·9	9·1								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

Notes and General Remarks.

(1) Sun shining; clear sky; wind N.N.W., light and variable.
(2) Cloudy; a pilot balloon first moved W., then N.W.
(3) Sky clear. (4) Wind very nearly W.
(5) A gun fired; felt the shock. (6) Sun shining brightly.
(7) Entered a S.W. current, moving towards the part of the river north of Erith. Very misty all round. (8) Sun shining brightly.
(9) Report of proving guns at Woolwich; perceptible vibration, every rope and the instruments were shaken.
(10) Opened the valve; nearly opposite Belvedere.
(11) Sun warm. (12) Between Erith and Belvedere.
(13) Ozone =o. (14) Wind N.N.W.
(15) Nearly opposite Erith; hills and dales distinctly visible.
(16) Sun-spectrum very fine. (17) Sand out.
(18) A little to the right, or nearly over Dartford.
(19) Moving towards Cobham Park.
(20) Cannot get any dew on either Daniell or Regnault.
(21) No ozone.
(22) South of Greenhithe; smoke near the earth moving S., but after reaching 1000 feet moving N.
(23) In a line with Northfleet; we shall pass over Cobham Park.

Table I. a.—Meteorological Observations made in the Twenty-third Balloon Ascent, from Woolwich Arsenal, December 1, 1864 (*continued*).

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened-bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Attached Therm.			Dry.	Wet.	Difference.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	3 40 0 p.m.	......	......	24·78	5,245	30·0	27·2	2·8	18·4								
	3 41 0 "	......	......	24·63	5,403	29·5	26·5	3·0	16·5								
	3 42 0 "	......	......	24·60	5,431	29·1	26·1	3·0	15·3								
	3 43 0 "	......	......	24·95	5,063	30·0	27·2	2·8	18·4								
	3 44 0 "	......	......	25·52	4,464	31·2	28·1	3·1	19·5								
	3 45 0 "	......	......	26·45	3,487	32·8	29·5	3·3	22·9								
(2)	3 46 0 "	......	......	26·47	3,470	33·0	29·5	3·5	22·5	......	......	......	......	......	21·5		
	3 46 30 "	......	......	26·45	3,491	33·0	29·8	3·2	23·1								
	3 47 0 "	......	......	26·20	3,759	33·0	29·7	3·3	23·1								
	3 48 0 "	......	......	26·00	3,973	33·0	27·8	5·2	17·4	......	......	......	......	......	......	[dew 15·0 no	33·0
(3)	3 49 0 "	......	......	25·82	4,170	33·0	28·0	5·0	15·0								
(4)	3 50 0 "	......	......	26·00	3,968	33·0	28·0	5·0	15·0								
	3 51 0 "	......	......	26·16	3,789	32·7	28·2	4·5	19·2								
(5)	3 52 0 "	......	......	26·20	3,744	32·4	28·5	3·9	20·0	......	......	......	......	......	[dew 20·0 no		
(6)	3 53 0 "	......	......	26·20	3,744	32·1	28·7	3·4	21·3								
	3 54 0 "	......	......	26·65	3,240	32·5	30·0	2·5	24·7	......	......	......	......	......	25·0		
	3 54 30 "	......	......	26·75	3,124	32·5	30·5	2·0	25·0								
	3 55 0 "	......	......	26·80	3,082	32·8	30·8	2·0	29·2								
	3 55 30 "	......	......	27·00	2,914	33·0	31·1	1·9	27·3								
(7)	3 56 0 "																
	3 57 0 "	......	......	27·30	2,662	34·0	32·0	2·0	28·5	......	......	......	......	......	28·0		
(8)	3 58 0 "	......	......	27·45	2,536	34·5	33·0	1·5	30·5								
(9)	3 59 0 "	......	......	27·50	2,497	35·2	33·5	1·7	30·8								
	4 0 0 "	......	......	27·30	2,691	35·5	33·6	1·9	30·7	......	......	......	......	......	30·0		
(10)	4 1 0 "	......	......	27·30	2,691	35·6	33·6	2·0	30·5								
(11)	4 1 30 "	......	......	27·20	2,788	35·7	33·6	2·1	30·3								
(12)	4 2 0 "	......	......	27·14	2,847	35·5	33·1	2·4	29·4								
(13)	4 3 0 "	......	......	27·25	2,744	35·0	33·0	2·0	29·8								
	4 4 0 "	......	......	27·40	2,603	35·5	33·3	2·2	30·0								
	4 5 0 "	......	......	28·00	2,039	36·2	34·8	1·4	32·7								
(14)	4 6 0 "	......	......	28·25	1,804	37·1	35·0	2·1	32·3								
(15)	4 7 0 "	......	......	28·30	1,759	37·3	35·5	1·6	33·0								
(16)	4 8 0 "	......	......	28·42	1,644	38·3	36·5	1·8	34·1								
	4 8 30 "	......	......	28·50	1,569	38·3	37·0	1·3	35·2								
(17)	4 9 0 "	......	......	28·52	1,550	38·7	37·5	1·2	35·8								
	4 10 0 "	......	......	28·60	1,475	39·0	38·0	1·0	36·7								
(18)	4 13 0 "	......	......	28·70	1,381	42·0	40·3	1·7	36·8								
(19)	4 14 0 "	......	......	28·80	1,280	42·1	40·2	1·9	37·9								
(20)	4 15 0 "	......	......	28·60	1,394	42·0	39·5	2·5	36·4								
	4 15 30 "	......	......	28·50	1,451	41·5	39·2	2·3	36·3								
(21)	4 17 0 "	......	......	28·35	1,532	41·2	38·7	2·5	35·5								
	4 18 0 "	......	......	28·40	1,496	40·5	39·0	1·5	37·1								
	4 19 0 "	......	......	28·50	1,424	41·5	39·5	2·0	37·0								
	4 20 0 "	......	......	28·70	1,280	42·0	39·7	2·3	36·4								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) No dew on either Daniell's or Regnault's Hygrometers.
(2) A chill to sense; sand thrown out.
(3) Heard voices.
(4) The setting sun illuminated the topmost part of a dark stratus cloud, with a very deep orange-colour; not a cloud in the sky above altitude 15°. Put magnets away.
(5) A sudden chill again.
(6) Sand thrown out.
(7) Wind W.N.W.; smoke below moving S.
(8) Heard a clock strike 4h plainly.
(9) Sand thrown out.
(10) Saw a railway-train.
(11) Heard people calling out.
(12) A great deal of moisture on the balloon.
(13) Nearly south of Gravesend.
(14) Heard many voices.
(15) Can hear cries of "come down;" wooded country.
(16) Cobham Park.
(17) Moist to sense.
(18) Moisture almost dropping from the balloon.
(19) Approaching the Medway.
(20) Ascending to a higher current to cross the river.
(21) We can see Rochester Bridge and Castle.

TABLE I. A.—Meteorological Observations made in the Twenty-third Balloon Ascent, from Woolwich Arsenal, December 1, 1864 (*continued*).

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Ther-mometers (free).				Gridiron Thermo-meter.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened-bulb Ther-mometer.
		Reading corrected and reduced to 32° Fahr.	Attached Therm.			Dry.	Wet.	Difference.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	4 21 0 p.m.	......	......	28·80	1,208	41·2	39·7	1·5	37·4								
	4 21 30 „	......	......	28·82	1,194	41·3	39·7	1·6	37·2								
	4 22 0 „	......	......	28·90	1,137	41·0	40·2	0·8	39·2								
	4 23 0 „	......	......	29·12	979	41·1	40·2	0·9	39·1								
(1)	4 35 0 „	......	......	......	ground												
	4 33 0 „	......	......	29·82	ground	45·2	43·0	2·2	40·5								

TABLE I. B.—Meteorological Observations made in the Twenty-fourth Balloon Ascent, from Woolwich Arsenal, December 30, 1864.

References to Notes.	Time.	Reading corrected	Attached Therm.	Aneroid	Height	Dry	Wet	Difference	Dew-point	Gridiron	Dry (asp.)	Wet (asp.)	Diff.	Dew-point (asp.)	Daniell's	Regnault's	Blackened-bulb
	2 12 0 p.m.	......	......	29·86	ground	42·5	39·0	3·5	34·8								
(2)	2 12 45 „	......	......	......	ground												
	2 13 0 „	......	......	29·80	80	42·1	38·5	3·6	34·1								
	2 14 0 „	......	......	29·51	355	41·0	37·2	3·8	32·4								
(3)	2 15 0 „	......	......	29·25	602	40·0	36·2	2·8	31·2								
	2 15 30 „	......	......	29·05	782	39·0	36·0	3·0	32·0								
	2 16 0 „	......	......	28·95	877	38·2	35·1	3·1	30·9								
(4)	2 16 30 „	......	......	28·80	1,020	37·2	34·8	2·4	31·5								
	2 16 45 „	......	......	28·50	1,321	36·2	34·2	2·0	31·2								
	2 17 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	30·5		
	2 18 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	30·0	
	2 18 30 „	......	......	27·80	1,995	34·1	32·9	1·2	30·8								
	2 19 0 „	......	......	27·60	2,220	33·0	32·0	1·0	30·0								
(5)	2 19 30 „	......	......	27·50	2,310	32·5	32·0	0·5	31·0								
(6)	2 19 45 „	......	......	27·45	2,355	32·7	31·8	0·9	30·0								
	2 20 0 „	......	......	27·40	2,410	32·5	31·9	0·6	30·7								
(7)	2 21 0 „																
	2 22 0 „	......	......	27·10	2,634	32·2	31·5	0·7	30·0	......	......	......	......	......	......	28·0	
	2 23 0 „	......	......	27·05	2,699	31·9	30·5	1·4	27·1								
(8)	2 23 30 „	......	......	27·05	2,699	31·9	30·8	1·1	28·3								
(9)	2 24 0 „	......	......	27·11	2,641	31·9	30·5	1·4	27·2								
(10)	2 25 0 „	......	......	27·40	2,350	31·9	31·0	0·9	28·9								
(11)	2 26 0 „	......	......	27·45	2,301	31·9	31·2	0·7	29·6								
	2 27 0 „	......	......	27·68	2,077	31·9	31·6	0·3	30·9	30·5							
(12)	2 27 15 „	......	......	27·75	2,019	32·3	32·0	0·3	30·4								
	2 27 30 „																
(13)	2 28 0 „	......	......	27·55	2,215	32·2	32·2	0·0	32·2								
	2 28 15 „	......	......	27·40	2,362	31·5	31·2	0·3	30·4								
(14)	2 28 30 „	......	......	27·21	2,552	31·3	30·6	0·7	28·9								
(15)	2 28 45 „																
(16)	2 29 0 „	......	......	26·92	2,822	29·5	29·0	0·5	27·3								
	2 29 30 „	......	......	26·71	3,018	28·8	28·3	0·5	26·4								
(17)	2 29 45 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	27·0	
(18)	2 30 0 „	......	......	26·48	3,228	27·5	27·2	0·3	26·0								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) On the ground at Delce Farm, near Rochester.
(2) Left the earth.
(3) Mist all round.
(4) Cold.
(5) Dropped the grapnel.
(6) Approaching cloud.
(7) In cloud.
(8) Just out of cloud; and over the wall of the river.
(9) At least 150 vessels in sight.
(10) Out of cloud.
(11) Our course is taking each bight of the river.
(12) Sand out.
(13) Cold to sense; approaching cloud.
(14) Edge of cloud.
(15) Entered cloud; lost sight of everything.
(16) Very cold.
(17) Much lighter; very cold.
(18) Cloud dense and cold; fog dazzlingly bright.

Table I. B.—Meteorological Observations made in the Twenty-fourth Balloon Ascent, from Woolwich Arsenal, December 30, 1864 (*continued*).

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated)				Hygrometers.		Delicate Blackened-bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Attached Therm.			Dry.	Wet.	Difference.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	2 31 0 p.m.	......	......	26·28	3,424	27·2	26·5	0·7	23·4								
	2 32 0 „	......	......	26·12	3,580	30·0	26·0	4·0	13·4								
(2)	2 32 15 „	......	......	26·12	3,580	29·5	26·2	3·3	15·0								
	2 33 0 „	......	......	26·00	3,735	31·5	26·0	5·5	12·2	......	......	......	......	......	15·0	14·0	
(3)	2 34 0 „																
	2 34 15 „	......	......	26·15	3,589	29·5	26·2	3·3	15·1								
	2 34 30 „	......	......	26·15	3,589	29·0	27·2	1·8	20·7	......	......	......	......	......	......	......	29·0
(4)	2 34 40 „																
	2 34 45 „	......	......	26·25	3,492	28·2	27·1	1·1	22·7								
	2 35 0 „	......	......	26·50	3,249	28·2	27·0	1·2	22·3	28·5							
(5)	2 35 30 „	......	......	27·20	2,570	28·2	28·0	0·2	27·3								
(6)	2 36 0 „	......	......	27·65	2,133	30·2	29·7	0·5	28·3								
	2 37 0 „	......	......	28·90	932	33·0	32·0	1·0	30·0								
(7)	2 38 0 „	......	......	28·95	837	34·0	32·5	1·5	29·0								
	2 39 0 „	......	......	29·05	797	34·5	32·9	1·6	30·2	......	......	......	......	......	......	......	34·5
(8)	2 40 0 „	......	......	29·18	689	35·2	33·5	1·7	30·8								
	2 41 0 „	......	......	29·05	1,009	35·9	33·8	2·1	30·6	36·0							
(9)	2 41 30 „	......	......	28·90	1,369	36·0	33·9	2·1	30·8								
	2 42 0 „	......	......	28·72	1,669	35·5	33·8	1·7	31·2	......	......	......	......	......	......	......	35·5
	2 43 0 „	......	......	28·60	1,929	35·5	33·5	2·0	31·1	......	......	......	......	......	......	......	35·5
	2 43 30 „	......	......	28·52	2,129	35·5	33·2	2·3	29·6								
	2 44 0 „	......	......	28·48	2,219	35·5	33·2	2·3	29·6	35·3	......	......	......	......	30·0		
	2 45 0 „	......	......	28·32	2,589	34·9	32·8	2·1	29·5								
	2 45 30 „	......	......	28·30	2,699	34·5	33·0	1·5	30·5								
	2 46 0 „	......	......	28·26	2,829	34·2	32·5	1·7	29·6								
	2 47 0 „	......	......	28·25	2,860	34·0	33·0	1·0	31·2								
	2 47 30 „	......	......	28·24	2,946	34·0	33·0	1·0	31·2								
	2 48 0 „	......	......	28·40	2,796	34·0	33·0	1·0	31·2								
	2 48 30 „	......	......	28·40	2,796	34·0	33·0	1·0	31·2								
	2 49 0 „	......	......	28·40	2,796	34·0	33·0	1·0	31·2								
	2 49 30 „	......	......	28·45	2,666	34·5	33·3	1·2	31·2								
	2 49 45 „	......	......	28·50	2,536	35·0	33·2	1·8	30·3								
	2 50 0 „	......	......	28·60	2,276	35·3	33·2	2·1	29·9								
	2 50 30 „	......	......	28·68	2,070	35·6	33·5	2·1	30·3								
	2 51 0 „	......	......	28·85	1,621	35·6	33·5	2·1	30·3	35·5							
	2 51 30 „	......	......	28·92	1,462	35·6	33·8	1·8	31·1								
	2 51 45 „	......	......	29·00	1,256	35·8	33·8	2·0	30·8	......	......	......	......	......	......	30·5	
	2 52 0 „	......	......	29·10	1,096	36·0	34·0	2·0	31·0								
	2 53 0 „	......	......	29·35	556	36·2	34·0	2·2	30·8								
	2 53 30 „	......	......	29·38	511	36·2	34·5	1·7	32·0								
	2 54 0 „	......	......	29·39	495	36·2	34·5	1·7	32·0								
	2 54 30 „	......	......	29·32	556	36·2	34·5	1·7	32·0								
	2 55 0 „	......	......	29·31	565	36·1	34·5	1·6	32·1	......	......	......	......	......	......	32·5	
	2 57 0 „	......	......	29·60	299	38·2	36·7	1·5	34·7								
	2 57 30 „	......	......	29·31	570	38·2	36·7	1·5	34·7								
(10)	2 58 30 „	......	......	29·20	670	38·2	35·5	2·7	34·9								
	2 59 0 „	......	......	28·95	900	37·2	36·0	1·2	34·4								
	3 0 0 „	......	......	28·78	1,056	37·2	36·0	1·2	34·4								
	1	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Sun shining dazzlingly. A beautiful sky of Prussian blue; not a cloud above us; beautiful sea of cloud below of varied surface, bright and shining.
(2) Sun brighter still.
(3) Sun observed in mist.
(4) In a very dense cloud.
(5) Out of cloud.
(6) Falling quickly; revolving in 2 minutes.
(7) We are about a mile north of Purfleet.
(8) Moving W.S.W.
(9) Moving towards Sea Reach.
(10) Sand thrown out.

TABLE I. B.—Meteorological Observations made in the Twenty-fourth Balloon Ascent, from Woolwich Arsenal, December 30, 1864 (*continued*).

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Attached Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Difference.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened-bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	3 1 0 p.m.	......	......	28·62	1,203	37·2	35·7	1·5	36·2								
	3 2 0 „	......	......	28·55	1,266	37·2	35·6	1·6	33·4								
	3 2 30 „	......	......	28·60	1,216	37·5	36·0	1·5	34·0								
(1)	3 3 0 „	......	......	28·70	1,116	37·8	36·0	1·8	34·2								
	3 3 45 „	......	......	29·05	766	37·8	36·2	1·6	34·0								
	3 4 0 „	......	......	29·42	396	38·2	36·4	1·8	33·9								
	3 5 0 „	......	......	29·50	316	38·2	36·4	1·8	33·9								
(2)	3 6 0 „	......	......	29·63	186	38·2	36·4	1·8	33·9								
(3)	3 10 0 „	......	......	......	} ground {												
	3 15 0 „	......	......	29·82		38·2	36·5	1·7	34·2								

TABLE I. C.—Meteorological Observations made in the Twenty-fifth Balloon Ascent, from Woolwich Arsenal, February 27, 1865.

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Attached Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Difference.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened-bulb Thermometer.
	1 25 0 p.m.	......	......	30·27	} ground {	47·7	42·4	5·3	36·5								
(4)	1 34 0 „	......	......	......		47·5	42·0	5·5	35·9								
(5)	1 52 0 „	......	......	30·20		52·1	45·2	6·9	38·0	......	......	......	......	......	......	34·2	
(6)	1 58 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	52·0
	1 58 10 „	......	......	30·13	60	51·8	45·2	6·6	38·5								
	1 58 20 „	......	......	30·00	176	51·4	44·8	6·6	38·1	......	......	......	......	......	......	......	52·0
	1 58 30 „	......	......	29·92	244	51·0	44·1	6·9	36·9								
	1 59 0 „	......	......	29·65	474	49·5	42·1	7·4	34·1	......	......	......	......	......	......	......	51·5
(7)	2 0 0 „	......	......	29·30	767	47·2	40·9	6·3	33·9								
(8)	2 1 0 „																
(9)	2 1 30 „	......	......	28·98	1,085	46·2	40·1	6·1	33·2								
	2 2 0 „	......	......	28·52	1,543	45·2	40·1	5·1	34·2								
(10)	2 2 30 „	......	......	28·21	1,851	43·7	38·9	4·8	33·1								
	2 2 45 „	......	......	27·78	2,279	41·2	37·1	4·1	32·0								
	2 3 0 „	......	......	......	......	......	......	......	......	......	......	......	......	......	......	29·0	
(11)	2 3 30 „	......	......	26·98	3,074												
(12)	2 4 0 „	......	......	26·72	3,333	35·5	33·0	2·5	29·1								
(13)	2 5 0 „	......	......	26·42	3,632	34·8	32·0	2·8	27·5								
(14)	2 5 30 „	......	......	26·20	3,851	34·8	32·0	2·8	27·5								
	2 6 0 „	......	......	26·05	3,990	35·0	31·6	3·4	27·2								
(15)	2 6 30 „	......	......	26·00	4,040	34·8	30·9	3·9	24·7	......	......	......	......	......	......	......	35·0
(16)	2 7 30 „	......	......	25·62	4,418	34·0	29·2	4·8	20·9	......	......	......	......	......	18·5		
(17)	2 8 30 „	......	......	25·39	4,647	34·0	28·3	5·7	18·2								
	2 9 0 „	......	......	25·34	4,697	34·5	28·5	6·0	17·1								
(18)	2 9 30 „	......	......	25·30	4,737	35·2	29·0	6·2	19·1								
(19)	2 11 0 „	......	......	25·30	4,737	38·2	31·1	7·1	21·6	......	......	......	......	......	......	19·0	
	2 11 30 „	......	......	25·25	4,795	38·2	30·6	7·6	20·3								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Moving direct for Sea Reach; we must come down if we do not change our direction.

(2) Packed up all the instruments, cleared the tops of some trees, and came down within a mile of the river, near the Railway Station at Stanford le Hope.

(3) On the ground.

(4) A pilot balloon went nearly due N. (5) Wind S. (6) Left the earth.

(7) Over the river. (8) Bells sound very clearly.

(9) Wind S.W.; sun obscured by cloud.

(10) Moving towards Barking Creek; moving N.E. (11) In cloud; cold.

(12) In a white cloud. (13) Faint gleams of light.

(14) We are in cloud, and over water; the clouds below are moving much more quickly than we; wind more westerly.

(15) Sun shining faintly; clouds at least three or four miles above us, moving W.; we are in a N.W. current.

(16) Clouds below appear to be moving N.; we are moving towards the E.

(17) The clouds below are moving at right angles to us.

(18) Over Barking level; Tilbury line to our left or N.; clouds have a very fine purple tinge over a very beautiful even surface; N. gloomy and dark; great contrast.

(19) Sensibly warmer.

Table I. c.—Meteorological Observations made in the Twenty-fifth Balloon Ascent, from Woolwich Arsenal, February 27, 1865 (*continued*).

References to Notes.	Time.	Siphon Barometer.		Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free).				Gridiron Thermometer.	Dry and Wet Therms. (aspirated).				Hygrometers.		Delicate Blackened-bulb Thermometer.
		Reading corrected and reduced to 32° Fahr.	Attached Therm.			Dry.	Wet.	Difference.	Dew-point.		Dry.	Wet.	Diff.	Dew-point.	Daniell's. Dew-point.	Regnault's. Dew-point.	
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
	2 12 0 p.m.	......	......	25·19	4,855	38·7	30·6	8·1	19·4								
(1)	2 12 30 ,,	......	......	25·17	4,875	38·7	29·7	9·0	17·7								
	2 13 0 ,,	......	......	25·17	4,875	39·2	29·4	9·8	16·5								
	2 17 0 ,,	......	......	25·08	4,965	39·2	29·2	10·0	16·1	......	......	......	......	......	15·0		
	2 22 30 ,,	......	......	......	......	38·2	29·0	9·2	16·6								
	2 23 0 ,,	......	......	25·30	4,828	38·2	29·0	9·2	16·6								
(2)	2 24 0 ,,	......	......	25·30	4,828	38·2	29·0	9·2	16·6								
(3)	2 25 0 ,,	......	......	25·30	4,828	38·2	29·0	9·2	16·6								
	2 27 0 ,,	......	......	25·30	4,828	38·2	27·5	10·7	13·0	......	......	......	......	......	......	15·0±	
(4)	2 27 30 ,,	......	......	25·25	4,840	38·2	27·5	10·7	13·0								
	2 28 0 ,,	......	......	25·22	4,847	38·1	27·2	10·9	12·4	......	......	......	......	......	......	......	38·3
	2 29 0 ,,	......	......	25·20	4,865	38·2	27·5	10·7	13·0								
	2 30 0 ,,	......	......	25·20	4,865	38·2	27·5	10·7	13·0								
(5)	2 34 0 ,,	......	......	25·60	4,408	39·2	29·5	9·7	16·7	......	......	......	......	......	17·0		
	2 34 20 ,,	......	......	25·60	4,408	39·4	30·0	9·4	17·7	......	......	......	......	......	......	16·0	
(6)	2 36 0 ,,	......	......	25·50	4,517	39·2	30·0	9·2	17·9								
(7)	2 37 0 ,,																
	2 38 0 ,,	......	......	25·42	4,604	39·2	30·0	9·2	17·9								
	2 40 0 ,,	......	......	25·30	4,734	41·2	31·5	9·7	19·3	......	......	......	......	......	......	......	45·0
	2 41 0 ,,	......	......	25·30	4,734	41·7	31·3	10·4	18·5								
(8)	....	......	......	......	......	42·0	31·0	11·0	17·5	......	......	......	......	......	......	......	43·5
(9)	2 42 0 ,,	......	......	25·50	4,538	42·0	31·0	11·0	17·5	......	......	......	......	......	......	......	43·5
	2 42 30 ,,	......	......	25·70	4,332	43·2	32·5	10·7	19·7								
	2 43 0 ,,	......	......	25·90	4,136	43·3	33·0	10·3	20·7								
	2 44 0 ,,	......	......	26·60	3,450	42·5	35·5	7·0	27·0								
(10)	2 45 0 ,,	......	......	26·78	3,274	42·0	36·0	6·0	28·6	......	......	......	......	......	......	......	42·5
	2 45 30 ,,	......	......	27·10	2,960	41·7	36·0	5·7	28·9								
	2 46 0 ,,	......	......	27·35	2,715	40·7	35·5	5·2	29·0								
(11)	2 46 20 ,,	......	......	27·40	2,676	40·5	36·0	4·5	30·2								
	2 46 30 ,,	......	......	27·55	2,529	41·0	36·5	4·5	30·8								
	2 47 0 ,,	......	......	27·70	2,382	41·0	37·5	3·5	33·1	......	......	......	......	......	......	33·0	
	2 48 0 ,,	......	......	27·72	2,360	41·0	38·0	3·0	34·2								
	2 48 30 ,,	......	......	27·72	2,360	41·2	38·0	3·2	34·0								
	2 49 0 ,,	......	......	27·75	2,330	41·8	38·0	3·8	33·3	......	......	......	......	......	34·0	......	41·0
	2 50 0 ,,	......	......	27·80	2,281	43·0	39·5	3·5	35·3								
	2 51 0 ,,	......	......	28·05	2,035	43·2	39·0	4·2	34·0								
	2 54 0 ,,	......	......	29·31	796	44·2	40·2	4·0	35·5								
	2 55 0 ,,	......	......	29·80	322	46·2	41·0	5·2	35·1								
	2 56 0 ,,	......	......	29·65	460	46·2	41·0	5·2	35·1								
	2 56 30 ,,	......	......	29·45	644	46·0	41·2	4·8	35·7	......	......	......	......	......	......	......	46·0
	2 57 30 ,,	......	......	29·14	927	44·5	40·0	4·5	34·7								
	2 58 0 ,,	......	......	29·11	957	43·5	39·5	4·0	34·7	......	......	......	......	......	35·0		
	2 59 0 ,,	......	......	29·00	1,057	43·5	39·0	4·5	33·6								
	2 59 30 ,,	......	......	28·90	1,148	43·5	38·5	5·0	32·6								
	3 0 0 ,,	......	......	28·92	1,130	43·0	38·5	4·5	33·1								
	3 1 0 ,,	......	......	28·98	1,075	43·0	38·5	4·5	33·1								
(12)	3 1 30 ,,	......	......	28·99	1,066	43·5	38·5	5·0	33·1								
	3 2 0 ,,	......	......	29·00	1,057	43·5	39·0	4·5	35·3								
	3 3 0 ,,	......	......	29·07	990	43·5	39·5	4·0	34·7								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) Over Dagenham Marsh.
(2) Lowered grapnel.
(3) Entered a more southerly current; about S.W.
(4) Clouds very high.
(5) Must come down.
(6) Sun again bright.
(7) Moving towards Long Reach.
(8) Sun hot.
(9) Opened valve.
(10) On level with lower clouds.
(11) Below cloud.
(12) Upper clouds moving as before; no sun.

TABLE I. c.—Meteorological Observations made in the Twenty-fifth

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Attached Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Ther- Dry.	Dry and Wet Ther- Wet.
	h m s	in.	°	in.	feet.	°	°
	3 4 0 p.m.	......	......	29.11	953	43.5	39.0
(1)	3 5 0 "	......	......	29.15	926	43.5	39.3
	3 5 30 "	......	......	29.50	605	43.5	39.0
	3 6 0 "	......	......	29.50	605	44.0	39.3
	3 7 0 "	......	......	29.61	504	44.5	40.0
	3 8 0 "	......	......	29.63	486	45.0	40.2
	3 9 0 "	......	......	29.68	441	45.3	40.3
	3 10 0 "	......	......	29.75	377	45.9	40.5
	3 11 0 "	......	......	29.80	322	45.5	40.4
	3 12 0 "	......	......	29.80	322	46.0	41.0
	3 12 30 "	......	......	29.65	459	46.0	41.0
	3 13 0 "	......	......	29.32	761	45.2	40.0
	3 14 0 "	......	......	29.30	779	45.2	40.0
	3 15 0 "						
	3 15 30 "	......	......	29.15	916	45.0	40.2
	3 16 0 "	......	......	29.00	1,053	44.2	39.8
	3 17 0 "	......	......	28.90	1,148	43.2	39.0
	3 17 30 "	......	......	28.90	1,148	43.2	39.0
	3 18 0 "	......	......	28.90	1,148	43.2	38.7
	3 19 0 "	......	......	29.08	978	43.2	38.5
	3 20 0 "	......	......	29.10	959	43.2	38.5
	3 21 0 "	......	......	29.30	770	43.2	38.0
	3 22 0 "	......	......	29.30	770	43.2	38.0
	3 23 0 "	......	......	29.30	770	43.2	38.1
	3 24 0 "	......	......	29.33	742	43.1	38.6
	3 25 0 "	......	......	29.50	582	43.3	39.0
	3 26 0 "	......	......	29.38	698	43.5	39.0
	3 27 0 "	......	......	29.20	872	43.5	39.2
	3 28 0 "	......	......	29.30	969	43.3	39.0
(2)	3 29 0 "	......	......	28.72	1,375	42.5	37.5
	3 30 0 "	......	......	28.55	1,463	42.0	37.3
	3 30 30 "	......	......	28.25	1,689	40.6	36.5
	3 31 0 "	......	......	28.00	1,944	39.6	36.0
	3 32 0 "	......	......	27.90	2,046	38.9	35.5
(3)	3 32 30 "	......	......	27.80	2,148	38.0	35.0
	3 33 0 "	......	......	27.72	2,230	37.9	35.0
	3 34 0 "						
	3 35 0 "	......	......	27.68	2,271	37.2	35.0
	3 37 0 "	......	......	27.50	2,455	37.2	34.5
(4)	3 38 0 "						
(5)	3 38 30 "	......	......	27.30	2,659	36.5	33.9
(6)	3 39 0 "	......	......	27.00	2,965	36.0	33.5
(7)	3 40 0 "	......	......	26.82	3,149	35.2	33.0
(8)	3 41 0 "	......	......	26.82	3,149	35.2	33.0
	3 42 0 "	......	......	26.78	3,190	34.2	32.1
	3 43 0 "	......	......	26.78	3,190	34.2	32.2
(9)	3 43 + "						
	3 44 0 "	......	......	26.61	3,360	34.2	32.0
	1.	2.	3.	4.	5.	6.	7.

(1) Neck of the balloon tied up.
(2) Twelve miles from Chelmsford.
(3) Changed direction; moving W., I think.
(4) Water looks like polished steel.

Balloon Ascent, from Woolwich Arsenal, February 27, 1865 (*continued*).

Time.	mometers (free). Difference.	mometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened-bulb Thermometer.
	°	°	°	°	°	°	°	°	°	°
3 4 0 p.m.	4.5	35.3								
3 5 0	4.2	34.3								
3 5 30	4.5	33.6								
3 6 0	4.7	33.8	......	......	......	......	......	34.0		
3 7 0	4.5	34.7								
3 8 0	4.8	34.6								
3 9 0	5.0	34.6								
3 10 0	5.4	34.4	......	......	......	......	......	......	32.0	
3 11 0	5.1	34.6								
3 12 0	5.0	35.3								
3 12 30	5.0	35.3								
3 13 0	5.2	34.0	......	......	......	......	......	34.0		
3 14 0	5.2	34.0	......	......	......	......	......	......	33.5	
3 15 0										
3 15 30	4.8	34.6								
3 16 0	4.4	34.6								
3 17 0	4.2	34.0								
3 17 30	4.2	34.0								
3 18 0	4.5	33.3	......	......	......	......	......	......	33.0	
3 19 0	4.7	32.9								
3 20 0	4.7	32.9								
3 21 0	5.2	31.8								
3 22 0	5.2	31.8								
3 23 0	5.1	32.0								
3 24 0	4.5	33.2	......	......	......	......	......	34.0±		
3 25 0	4.3	33.9								
3 26 0	4.5	33.6								
3 27 0	4.3	34.0								
3 28 0	4.3	33.9								
3 29 0	5.0	31.4								
3 30 0	4.7	31.6								
3 30 30	4.1	31.2								
3 31 0	3.6	......	......	......	......	......	......	......	30.0	
3 32 0	3.4	31.3								
3 32 30	3.0	30.9								
3 33 0	2.9	31.0								
3 34 0										
3 35 0	2.2	31.9	......	......	......	......	......	30.5		
3 37 0	2.7	30.7								
3 38 0										
3 38 30	2.6	30.1								
3 39 0	2.5	29.7								
3 40 0	2.2	29.5								
3 41 0	2.2	29.5								
3 42 0	2.1	28.4								
3 43 0	2.0	28.7								
3 43 +										
3 44 0	2.2	28.3								
	8.	9.	10.	11.	12.	13.	14.	15.	16.	17

(5) Country brightened up by the sun. In haze.
(6) In thicker haze; only one bag of ballast.
(7) In cloud.
(8) In cloud.
(9) Mist.

TABLE I. c.—Meteorological Observations made in the Twenty-fifth Balloon Ascent, from Woolwich Arsenal, February 27, 1865 (*continued*).

References to Notes.	Time.	Siphon Barometer. Reading corrected and reduced to 32° Fahr.	Siphon Barometer. Attached Therm.	Aneroid Barometer, No. 2.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Dry and Wet Thermometers (free). Wet.	Dry and Wet Thermometers (free). Difference.	Dry and Wet Thermometers (free). Dew-point.	Gridiron Thermometer.	Dry and Wet Therms. (aspirated). Dry.	Dry and Wet Therms. (aspirated). Wet.	Dry and Wet Therms. (aspirated). Diff.	Dry and Wet Therms. (aspirated). Dew-point.	Hygrometers. Daniell's. Dew-point.	Hygrometers. Regnault's. Dew-point.	Delicate Blackened-bulb Thermometer.
	h m s	in.	°	in.	feet.	°	°	°	°	°	°	°	°	°	°	°	°
(1)	3 44 30 p.m.																
(2)	3 45 0 „	......	......	26·45	3,521	33·0	32·0	1·0	30·0	......	......	......	......	......	30·5		
(3)	3 45 30 „	......	......	26·32	3,652												
	3 45 40 „	......	......	26·20	3,772	33·0	32·0	1·0	30·0								
(4)	3 46 0 „	......	......	26·52	3,415	32·5	32·0	0·5	31·0	......	......	......	......	......	30·7		
	3 47 0 „	......	......	26·72	3,218	32·5	31·7	0·8	30·0								
	3 48 0 „	......	......	26·90	3,042	32·5	32·0	0·5	31·0	......	......	......	......	......	......	30·5	
(5)	3 49 0 „	......	......	27·30	2,650	32·5	32·0	0·5	31·0								
	3 50 0 „	......	......	27·32	2,637	33·1	32·7	0·4	31·9								
	3 51 0 „	......	......	27·71	2,252	34·2	33·1	1·1	31·2								
	3 52 0 „	......	......	28·20	1,793	35·5	33·0	2·5	29·2								
	3 54 0 „	......	......	29·00	1,023	42·0	38·0	4·0	33·1								
	3 55 0 „	......	......	29·30	731	42·5	38·7	3·8	34·0								
	3 56 0 „	......	......	29·40	634	43·0	39·2	3·8	34·6								
	3 56 30 „	......	......	29·47	561	43·8	39·5	4·3	34·4								
	3 57 0 „	......	......	29·56	472	43·7	39·8	3·9	35·1								
	3 57 30 „	......	......	29·70	448	44·0	40·2	3·8	35·7								
	3 58 0 „	......	......	29·79	331	44·2	40·6	3·6	36·4								
	3 59 0 „	......	......	29·80	322	44·4	40·8	3·6	36·6								
(6)	3 59 30 „	......	......	29·85	70	44·5	40·9	3·6	36·7								
	4 0 0 „	......	......	29·89	ground.	44·5	41·2	3·3	37·3								
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.

(1) In cloud; cold. (2) In fog.
(3) Opened valve; one bag of ballast only.
(4) In cloud. (5) Out of cloud.
(6) Just over some trees.

§ 4. Adopted Temperatures of the Air, the Wet-bulb, and the Dew-point in Three Balloon Ascents.

From all the observations of the temperature of the air, evaporation, and dew-point in Table I., a determination was made of these elements, with the corresponding reading or mean of readings of the barometer and heights, and then the next Table was formed.

Table II. a.—Showing the adopted Reading of the Barometer, calculated Height above the Sea, Temperature of the Air, Temperature of the Wet-bulb Thermometer, and Temperature of the Dew-point, in the

Twenty-third Ascent.—December 1, 1864.

Time of observation. A.M.	Reading of the Barom reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°
11 35 0	......	on the ground	46.5		
	30.15		46.2	43.8	
P.M.	30.19		......	43.2	
1 15 0	......		46.8	43.2	
2 30 0	30.10		48.0	44.2	40.0
37 0	29.95	206	48.2	44.1	39.6
38 0	29.61	515	48.0	44.0	39.6
38 30	29.38	584	47.5	43.2	38.5
39 0	29.20	890	47.2	43.3	38.9
40 0	28.85	1230	46.0	42.0	37.4
41 0	28.45	1618	45.0	41.2	36.8
42 0	28.23	1831	43.5	40.2	36.3
43 0	27.80	2248	43.0	38.7	37.9
44 0	27.40	2636	41.0	36.0	29.7
45 0	26.70	3298	40.0	36.0	29.7
46 0	26.42	3570	39.5	34.9	28.6
48 0	26.19	3804	38.5	33.0	25.6
50 0	25.78	4222	38.0	32.0	23.8
51 0	25.68	4324	38.0	32.0	23.8
54 0	25.30	4630	36.0	29.1	18.7
55 0	25.19	4742	35.0	28.5	15.5
57 0	24.90	5038	33.0	26.1	12.5
58 0	24.70	5328	31.5	26.1	12.2
59 0	24.70	5328	31.5	26.1	12.2
3 5 0	25.50	4496	31.2	26.5	15.6
6 30	25.67	4319	31.2	26.5	15.6
8 0	25.80	4184	33.0	29.1	21.3
9 0	25.85	4128	33.5	29.8	21.9
10 0	25.80	4170	34.5	30.0	22.4
14 0	25.09	4766	32.2	29.1	22.0
15 0	24.92	4909	31.8	27.2	16.6
17 0	24.90	4951	31.0	27.1	16.5
23 0	24.78	5052	30.2	25.1	9.1
24 0	24.72	5122	29.8	25.0	9.8
26 0	24.70	5197	30.2	25.1	8.9
27 0	25.00	4931	30.2	25.2	8.9
32 0	25.50	4489	31.5	28.1	9.6

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°
3 33 0	25.45	4541	32.0	28.1	9.1
34 0	25.20	4805	32.0	28.1	9.1
40 0	24.78	5245	30.0	27.2	18.4
41 0	24.63	5403	29.5	26.5	16.5
42 0	24.60	5431	29.1	26.1	15.3
43 0	24.95	5063	30.0	27.2	18.4
44 0	25.52	4464	31.2	28.1	19.8
45 0	26.45	3487	32.8	29.5	22.9
46 0	26.47	3470	33.0	29.5	22.5
46 30	26.45	3491	33.0	29.8	23.1
47 0	26.20	3759	33.0	29.7	23.1
48 0	26.00	3973	33.0	27.8	17.4
49 0	25.82	4170	33.0	28.0	15.0
50 0	26.00	3968	33.0	28.0	15.0
51 0	26.16	3789	32.7	28.2	19.2
52 0	26.20	3744	32.4	28.5	20.0
53 0	26.20	3744	32.1	28.7	21.3
......	......	3759	32.4		
54 0	26.65	3240	32.5	30.0	24.7
54 30	26.75	3124	32.5	30.5	25.0
55 0	26.80	3082	32.8	30.8	29.2
55 30	27.00	2914	33.0	31.1	27.3
57 0	27.30	2662	34.0	32.0	28.5
58 0	27.45	2536	34.5	33.0	30.5
59 0	27.50	2497	35.2	33.5	30.8
4 0 0	27.30	2691	35.5	33.6	30.7
1 0	27.30	2691	35.6	33.6	30.5
1 30	27.20	2788	35.7	33.6	30.3
2 0	27.14	2847	35.8	33.1	29.4
3 0	27.25	2744	35.0	33.0	29.8
4 0	27.40	2603	35.5	33.3	30.0
5 0	28.00	2039	36.2	34.8	32.7
6 0	28.25	1804	37.1	35.0	32.3
7 0	28.30	1759	37.3	35.5	33.0
8 0	28.42	1644	38.3	36.5	34.1
8 30	28.50	1569	38.3	37.0	35.2
9 0	28.52	1550	38.7	37.5	35.8

Table II. a.—Twenty-third Ascent.—December 1, 1864 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°
4 10 0	28.60	1475	39.0	38.0	36.7
13 0	28.70	1381	42.0	40.3	36.8
14 0	28.80	1280	42.1	40.2	37.9
15 0	28.60	1394	42.0	39.5	36.4
15 30	28.50	1451	41.5	39.2	36.3
17 0	28.35	1532	41.2	38.7	35.5
18 0	28.40	1496	40.5	39.0	37.1
19 0	28.50	1424	41.5	39.5	37.0

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°
4 20 0	28.70	1280	42.0	39.7	36.4
21 0	28.80	1208	41.2	39.7	37.4
21 30	28.82	1194	41.3	39.7	37.2
22 0	28.90	1137	41.0	40.2	39.2
23 0	29.12	979	41.1	40.2	39.1
25 0	......	ground			
33 0	......		45.2	43.0	40.5

b. Twenty-fourth Ascent.—December 30, 1864.

2 12 0	29.86	ground	42.5	39.0	34.8
13 0	29.80	80	42.1	38.5	34.1
14 0	29.51	355	41.0	37.2	32.4
15 0	29.25	602	40.0	36.2	31.2
15 30	29.05	782	39.0	36.0	32.0
16 0	28.95	877	38.2	35.1	30.9
16 30	28.80	1020	37.2	34.8	31.5
16 45	28.50	1321	36.2	34.2	31.2
17 0	......	......	...	......	30.5
18 0	......	......	...	......	30.0
18 30	27.80	1995	34.1	32.9	30.8
19 0	27.60	2220	33.0	32.0	30.0
19 30	27.50	2310	32.5	32.0	31.0
19 45	27.45	2355	32.7	31.8	30.0
20 0	27.40	2410	32.5	31.9	30.7
22 0	27.16	2634	32.2	31.5	30.0
23 0	27.05	2699	31.9	30.5	27.1
23 30	27.05	2699	31.9	30.8	28.3
24 0	27.11	2641	31.9	30.5	27.2
25 0	27.40	2350	31.9	31.0	28.9
26 0	27.45	2301	31.9	31.2	29.6
27 0	27.68	2077	31.9	31.6	30.9
27 15	27.75	2019	32.3	32.0	30.4
28 0	27.55	2215	32.2	32.2	32.2
28 15	27.40	2362	31.5	31.2	30.4
28 30	27.21	2552	31.3	30.6	28.9
29 0	26.92	2822	29.5	29.0	27.3
29 30	26.71	3018	28.8	28.3	26.4
29 45	......	......	...	......	27.0
30 0	26.48	3228	27.5	27.2	26.0
31 0	26.28	3424	27.2	26.5	23.4
32 0	26.12	3580	30.0	26.0	13.4
32 15	26.12	3580	29.5	26.2	15.0
33 0	26.00	3735	31.5	26.0	12.2
34 15	26.15	3589	29.5	26.2	15.1
34 30	26.15	3589	29.0	27.2	20.7
34 45	26.25	3492	28.2	27.1	22.7
35 0	26.50	3249	28.2	27.0	22.3
35 30	26.20	2570	28.2	28.0	27.3
36 0	27.65	2133	30.2	29.7	28.3
37 0	28.90	932	33.0	32.0	30.0
38 0	28.95	837	34.0	32.5	29.8
39 0	29.05	797	34.5	32.9	30.2

2 40 0	29.18	689	35.2	33.5	
41 0	29.05	1009	35.9	33.8	
41 30	28.90	1369	36.0	33.9	30.8
42 0	28.72	1669	35.5	33.8	31.2
43 0	28.60	1929	35.5	33.5	31.1
43 30	28.52	2129	35.5	33.2	29.6
44 0	28.48	2219	35.5	33.2	29.6
45 0	28.32	2689	34.9	32.8	29.4
45 30	28.30	2699	34.5	33.0	30.5
46 0	28.26	2829	34.2	32.5	29.6
47 0	28.25	2860	34.0	33.0	31.2
47 30	28.24	2946	34.0	33.0	31.2
48 0	28.40	2796	34.0	33.0	31.2
48 30	28.40	2796	34.0	33.0	31.2
49 0	28.40	2796	34.0	33.0	31.2
49 30	28.45	2666	34.5	33.3	31.2
49 45	28.50	2536	35.0	33.2	30.3
50 0	28.60	2276	35.3	33.2	29.9
50 30	28.68	2070	35.6	33.5	30.3
51 0	28.85	1621	35.6	33.5	30.3
51 30	28.92	1462	35.6	33.8	31.1
51 45	29.00	1256	35.8	33.8	30.8
52 0	29.10	1096	36.0	34.0	31.0
53 0	29.35	556	36.2	34.0	30.8
53 30	29.38	511	36.2	34.5	32.0
54 0	29.39	495	36.2	34.5	32.0
54 30	29.32	556	36.2	34.5	32.0
55 0	29.31	565	36.1	34.5	32.1
57 0	29.60	299	38.2	36.7	34.7
57 30	29.31	570	38.2	36.7	34.7
58 30	29.20	670	38.2	35.5	34.9
59 0	28.95	900	37.2	36.0	34.4
3 0 0	28.78	1056	37.2	36.0	34.4
1 0	28.62	1203	37.2	35.7	34.2
2 0	28.55	1266	37.2	35.6	33.4
2 30	28.60	1216	37.5	35.6	34.0
3 0	28.70	1116	37.8	36.2	34.2
3 45	29.05	766	37.8	36.2	34.0
4 0	29.42	396	38.2	36.4	33.9
5 0	29.50	316	38.2	36.4	33.9
6 0	29.63	186	38.2	36.4	33.9
15 0	29.82	ground.	38.2	36.5	34.2

TABLE II. B.—TWENTY-FOURTH ASCENT.—December 30, 1864 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°
1 25 0	30·27	ground	47·7	42·4	36·5
35 0	......	ground	47·5	42·0	35·9
52 0	30·20	ground	52·1	45·2	38·0
58 10	30·13	60	51·8	45·2	38.5
58 20	30·00	176	51·4	44·8	38·1
58 30	29·92	244	51·0	44·1	36·9
59 0	29·65	474	49·5	42·1	34·1
2 0 0	29·30	767	47·2	40·9	33·9
1 30	28·98	1085	46·2	40·1	33·2
2 0	28·52	1543	45·2	40·1	34·2
2 30	28·21	1851	43·7	38·9	33·1
2 45	27·78	2279	41·2	37·1	32·0
3 0	......	......	......	......	29·0
3 30	26·98	3074			
4 0	26·72	3333	35·5	33·0	29·1
5 0	26·42	3632	34·8	32·0	27·5
5 30	26·20	3851	34·8	32·0	27·5
6 0	26·05	3990	35·0	31·6	27·2
6 30	26·00	4040	34·8	30·9	24·7
7 30	25·62	4418	34·0	29·2	20·9
8 30	25·39	4647	34·0	28·3	18·2
9 0	25·34	4697	34·5	28·5	17·1
9 30	25·30	4737	35·2	29·0	19·1
11 0	25·30	4737	38·2	31·1	21·6
11 30	25·25	4795	38·2	30·6	20·3
12 0	25·19	4855	38·7	30·6	19·4
12 30	25·17	4875	38·7	29·7	17·7
13 0	25·17	4875	39·2	29·4	16·5
17 0	25·08	4965	39·2	29·2	16·1
22 30	......	......	38·2	29·0	16·6
23 0	25·30	4828	38·2	29·0	16·6
24 0	25·30	4828	38·2	29·0	16·6
25 0	25·30	4828	38·2	29·0	16·6
27 0	25·30	4828	38·2	27·5	13·0
27 30	25·25	4840	38·2	27·5	13·0
28 0	25·22	4847	38·1	27·2	12·4
29 0	25·20	4865	38·2	27·5	13·0
30 0	25·20	4865	38·2	27·5	13·0
34 0	25·60	4408	39·2	29·5	16·7
34 20	25·60	4408	39·4	30·0	17·7
36 0	25·50	4517	39·2	30·0	17·9
38 0	25·42	4604	39·2	30·0	17·9
40 0	25·30	4734	41·2	31·5	19·3
41 0	25·30	4734	41·7	31·3	18·5
......	......	......	42·0	31·0	17·5
42 0	25·50	4538	42·0	31·0	17·5
42 30	25·70	4332	43·2	32·5	19·7
43 0	25·90	4136	43·3	33·0	20·7
44 0	26·60	3450	42·5	35·5	27·0
45 0	26·78	3274	42·0	36·0	28·6
45 30	27·10	2960	41·7	36·0	28·9
46 0	27·35	2715	40·7	35·5	29·0
46 20	27·40	2676	40·5	36·0	30·2
46 30	27·55	2529	41·0	36·5	30·8
47 0	27·70	2382	41·0	37·5	33·1
48 0	27·72	2360	41·0	38·0	34·2
2 48 30	27·72	2360	41·2	38·0	34·0
49 0	27·75	2330	41·8	38·0	33·3
50 0	27·80	2281	43·0	39·5	35·3
51 0	28·05	2035	43·2	39·0	34·0
54 0	29·31	796	44·2	40·2	35·5
55 0	29·80	322	46·2	41·0	35·1
56 0	29·65	460	46·2	41·0	35·1
56 30	29·45	644	46·0	41·2	35·7
57 30	29·14	927	44·5	40·0	34·7
58 0	29·11	957	43·5	39·5	34·7
59 0	29·00	1057	43·5	39·0	33·6
59 30	28·90	1148	43·5	38·5	32·6
3 0 0	28·92	1130	43·0	38·5	33·1
1 0	28·98	1075	43·0	38·5	33·1
1 30	28·99	1066	43·5	38·5	33·1
2 0	29·00	1057	43·5	39·0	35·3
3 0	29·07	990	43·5	39·5	34·7
4 0	29·11	953	43·5	39·0	35·3
5 0	29·15	926	43·5	39·3	34·3
5 30	29·50	605	43·5	39·0	33·6
6 0	29·50	605	44·0	39·3	33·8
7 0	29·61	504	44·5	40·0	34·7
8 0	29·63	486	45·0	40·2	34·6
9 0	29·68	441	45·3	40·3	34·6
10 0	29·75	377	45·9	40·5	34·4
11 0	29·80	322	45·5	40·4	34·6
12 0	29·80	322	46·0	41·0	35·3
12 30	29·65	459	46·0	41·0	35·3
13 0	29·32	761	45·2	40·0	34·0
14 0	29·30	779	45·2	40·0	34·0
15 30	29·15	916	45·0	40·2	34·6
16 0	29·00	1053	44·2	39·8	34·6
17 0	28·90	1148	43·2	39·0	34·0
17 30	28·90	1148	43·2	39·0	34·0
18 0	28·90	1148	43·2	38·7	33·3
19 0	29·08	978	43·2	38·5	32·9
20 0	29·10	959	43·2	38·5	32·9
21 0	29·30	770	43·2	38·0	31·8
22 0	29·30	770	43·2	38·0	31·8
23 0	29·30	770	43·2	38·1	32·0
24 0	29·33	742	43·1	38·6	33·2
25 0	29·50	582	43·3	39·0	33·9
26 0	29·38	698	43·5	39·0	33·6
27 0	29·20	872	43·5	39·2	34·0
28 0	28·30	969	43·3	39·0	33·9
29 0	28·72	1375	42·5	37·5	31·4
30 0	28·55	1463	42·0	37·3	31·6
30 30	28·25	1689	40·6	36·5	31·2
31 0	28·00	1944	39·6	36·0	
32 0	27·90	2046	38·9	35·5	31·3
32 30	27·80	2148	38·0	35·0	30·9
33 0	27·72	2230	37·9	35·0	31·0
35 0	27·68	2271	37·2	35·0	31·9
37 0	27·50	2455	37·2	34·5	30·7
38 30	27·30	2659	36·5	33·9	30·1
39 0	27·00	2965	36·0	33·5	29·7

TABLE II. B.—TWENTY-FOURTH ASCENT.—December 30, 1864 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°
3 40 0	26·82	3149	35·2	33·0	29·5
41 0	26·82	3149	35·2	33·0	29·5
42 0	26·78	3190	34·2	32·1	28·4
43 0	26·78	3190	34·2	32·2	28·7
44 0	26·61	3360	34·2	32·0	28·3
45 0	26·45	3521	33·0	32·0	30·0
45 30	26·32	3652			
45 40	26·20	3772	33·0	32·0	30·0
46 0	26·52	3415	32·5	32·0	31·0
47 0	26·72	3218	32·5	31·7	30·0
48 0	26·90	3042	32·5	32·0	31·0
49 0	27·30	2650	32·5	32·0	31·0
50 0	27·32	2637	33·1	32·7	31·9
3 51 0	27·71	2252	34·2	33·1	31·2
52 0	28·20	1793	35·5	33·0	29·2
54 0	29·00	1022	42·0	38·0	33·1
55 0	29·30	731	42·5	38·7	34·0
56 0	29·40	634	43·0	39·2	34·6
56 30	29·47	561	43·8	39·5	34·4
57 0	29·56	472	43·7	39·8	35·1
57 30	29·70	448	44·0	40·2	35·7
58 0	29·79	331	44·2	40·6	36·4
59 0	29·80	322	44·4	40·8	36·6
59 30	29·85	70	44·5	40·9	36·7
4 0 0	29·89	ground	44·5	41·2	37·3

§ 5. Variation of Temperature of the Air with Height.

Every reading of temperature in the preceding Tables, or the means of small groups of readings when observations have been taken in quick succession at about the same altitude, or when the Balloon has passed and repassed through nearly the same space within a few minutes—as, for example, on December 1st, between $3^h\ 44^m$ and $3^h\ 49^m$ it fell from 4464 feet to 3470 feet, and rose to 4170 feet—these readings, or means of readings, were laid down on diagrams, the points joined, and a curved line made to pass through or near them, so that the area of the spaces between the original and the adopted lines on one side was equal to that of the spaces on the other side. Thus treated, temperature decreased with increase of elevation on December 1st and 30th. On February 27th it was found to increase, after attaining the altitude of 4647 feet. On descending, the temperature at first declined, and at 4800 feet the reading was the same as at the same elevation on ascending; then a warm current was met with, and the readings at the same elevation were much higher than were noted in ascending, and continued so through a space of 2800 feet, below which they were lower than on ascending; in consequence of these differences no temperature has been adopted for these, and another ascent and descent were made, for which temperatures have been adopted.

The numbers in the first column show the height in feet, beginning at the ground and increasing upwards; the numbers in the second column show the interval of time in ascending to the highest point; the notes in the third column show the circumstances of the observations; the numbers in the fourth and fifth columns the observed and the approximate normal temperatures of the air; and those in the next column the difference between the two preceding columns, or the most probable effect of the presence of cloud or mist on the temperature, or other local disturbing causes.

The next group of columns is arranged similarly for the descent, and the other groups for succeeding ascents and descents.

Table III.—Showing the Temperature of the Air, as read off the curve drawn through the observed temperatures, and as read off the curve of most probable normal temperatures, called adopted temperatures, and the calculated amount of disturbance from the assumed law of decrease of temperature.

Twenty-third Ascent.

1864. December 1. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temperature.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temperature.	Calculated effect of disturbance.
			°	°	°			°	°	°
5400	From $2^h\ 30^m$ to $3^h\ 42^m$ p.m.	Generally clear.	29·3	29·5	− 0·2	From $3^h\ 43^m$ to $4^h\ 33^m$ p.m.	Generally clear.	29·3	29·1	+ 0·2
5200			30·9	30·8	+ 0·1			29·6	29·6	0·0
5000			31·1	31·7	− 0·6			30·0	30·1	− 0·1
4800			32·5	32·8	− 0·3			30·5	30·3	+ 0·2
4600			33·6	33·6	0·0			31·0	30·5	+ 0·5
4400			34·6	35·1	− 0·5			31·4	30·8	+ 0·6
4200			36·9	36·2	+ 0·7			31·8	31·2	+ 0·6
4000			37·0	37·1	− 0·1			32·4	31·7	+ 0·7
3800			38·6	37·9	+ 0·7			32·5	32·1	+ 0·4
3600			39·3	38·6	+ 0·7			32·4	32·4	0·0
3400			39·8	39·2	+ 0·6			32·5	32·7	− 0·2
3200			40·1	39·7	+ 0·4			32·6	33·1	− 0·5
3000			40·3	40·2	+ 0·1			33·0	33·6	− 0·6
2800			40·7	40·8	− 0·1			33·5	34·1	− 0·6
2600			41·2	41·5	− 0·3			35·0	34·5	+ 0·5
2400			42·3	42·2	+ 0·1			35·7	35·0	+ 0·7
2200			43·0	43·0	0·0			36·2	35·7	+ 0·5
2000			43·2	43·7	− 0·5			36·6	36·8	− 0·2
1800			43·8	44·4	− 0·6			37·1	38·0	− 0·9
1600			45·5	45·0	+ 0·5			38·3	38·9	− 0·6
1400			45·8	45·6	+ 0·2			41·6	40·0	+ 1·6
1200			46·2	46·2	0·0			41·2	41·1	+ 0·1
1000			46·8	46·7	+ 0·1			40·9	41·9	− 1·0
800			47·0	47·2	− 0·2			41·7	42·4	− 0·7
600			47·2	47·6	− 0·4			42·6	43·0	− 0·4
400			48·0	47·9	+ 0·1			43·4	43·6	− 0·2
200			48·2	48·0	+ 0·2			45·3	44·3	+ 1·0
0			48·0	48·0	0·0			45·4	45·1	+ 0·3

December 1.—The temperature of the air at the height of 400 feet was the same as on the ground, viz. 48°; on passing above this point the temperature declined to $47\frac{1}{4}$° at 600 feet, very slowly to $45\frac{1}{2}$° at 1600 feet; a decrease of $1\frac{3}{4}$° then took place in the next 200 feet, remained very nearly the same for 400 feet more, and then declined to $41\frac{1}{4}$° at 2600 feet, still decreasing gradually to $38\frac{1}{2}$° at 3800 feet, and then rather more quickly to $29\frac{1}{4}$° at the highest point. On descending, the temperature increased very uniformly till 4000 feet was passed, then almost without change through a decline of 800 feet, or to 3200 feet high; increased 1° in the next 400 feet downwards, and $1\frac{1}{2}$° in the succeeding 200 feet; after this the temperature increased by pretty even amounts, till the height of 1800 feet was reached; here a warm current was entered, for by the time the balloon had descended to 1400 feet, the temperature had increased to $41\frac{1}{2}$°; it then declined to 41° at 1000 feet,

after which it increased by even amounts till within 200 feet of elevation, where the temperature was 45°·3, being only 0°·1 less than that found on the ground.

TABLE III. (*continued.*)

TWENTY-FOURTH ASCENT.

1864. December 30	Temperature of the Air.									
	Ascending.					Descending.				
Height, in feet, above the mean level of the sea.	Between what times.	Circumstances.	Observed temp.	Adopted temperature.	Calculated effect of disturbance.	Between what times.	Circumstances.	Observed temp.	Adopted temperature.	Calculated effect of disturbance.
			°	°	°			°	°	°
2600	From 2^h 12^m to 2^h 23^m 30^s p.m.	Just out of cloud.	32·3	32·0	+ 0·3	From 2^h 24^m to 2^h 27^m 15^s p.m.		31·8	31·8	0·0
2400		Entered cloud.	32·5	32·5	0·0			31·9	31·9	0·0
2200		Approaching cloud.	33·0	33·1	− 0·1		Approaching cloud.	32·0	32·0	0·0
2000			34·1	33·8	+ 0·3			32·5	32·5	0·0
1800			34·8	34·8	0·0			The balloon then turned to ascend.		
1600			35·6	35·6	0·0					
1400			36·1	36·1	0·0					
1200			36·9	36·9	0·0					
1000			37·8	37·6	+ 0·2					
800			39·0	39·0	0·0					
600		Misty.	40·0	39·9	+ 0·1					
400			40·9	40·9	0·0					
200			41·6	41·6	0·0					
0			42·6	42·6	0·0					
3600	From 2^h 28^m to 2^h 32^m 15^s p.m.	Above cloud, sun dazzlingly bright.	29·6	29·5	+ 0·1	From 2^h 33^m to 2^h 39^m p.m.	Above cloud.	29·0	29·3	− 0·3
3400			27·1	27·4	− 0·3		In very dense cloud.	28·4	28·4	0·0
3200		In dense cloud.	27·7	27·7	0·0			28·4	28·4	0·0
3000			28·8	28·6	+ 0·2			28·3	28·3	0·0
2800			29·5	29·6	− 0·1			28·2	28·2	0·0
2600		Just entering cloud.	31·0	30·6	+ 0·4		Out of cloud.	28·2	28·5	− 0·3
2400			31·2	31·3	− 0·1			29·0	29·1	− 0·1
2200			32·2	32·2	0·0			30·0	29·8	+ 0·2
2000			32·5	33·1	− 0·6			30·6	30·6	0·0
1800								31·1	31·1	0·0
1600								31·6	31·6	0·0
1400								32·1	32·1	0·0
1200								32·5	32·5	0·0
1000								33·0	33·1	− 0·1
800								34·2	34·2	0·0
								The balloon then turned to ascend.		

TABLE III. (*continued.*)

TWENTY-FOURTH ASCENT (*continued*).

1864. Dec. 30 (*con*).	Temperature of the Air.									
	Ascending.					Descending.				
Height, in feet, above the mean level of the sea.	Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Between what times.	Circumstances.	Observed temp.	Adopted temperature.	Calculated effect of disturbance.
			°	°	°			°	°	°
2800	From 2^h 40^m to 2^h 47^m 30^s p.m.	Under cloud.	34·3	34·4	−0·1	From 2^h 48^m to 2^h 57^m p.m.	Under cloud.	34·0	34·3	−0·3
2600			35·0	34·9	+0·1			35·0	35·0	0·0
2400			35·4	35·3	+0·1			35·1	35·2	−0·1
2200			35·5	35·3	+0·2			35·3	35·3	0·0
2000			35·6	35·6	0·0			35·3	35·4	−0·1
1800			35·6	35·6	0·0			35·5	35·5	0·0
1600			35·6	35·6	0·0			35·6	35·6	0·0
1400			36·0	35·8	+0·2			35·7	35·7	0·0
1200			36·0	36·0	0·0			35·9	35·8	+0·1
1000			36·0	36·0	0·0			36·0	35·9	+0·1
800			35·9	35·9	0·0			36·1	36·1	0·0
600			......	......	......			36·3	36·4	−0·1
400			......	......	......			37·5	37·2	+0·3
								The balloon then turned to ascend.		
1200	From 2^h 57^m 30^s to 3^h 2^m p.m.	Below cloud.	37·2	37·2	0·0	From 3^h 2^m 30^s to 3^h 15^m p.m.	Below cloud.	37·7	37·6	+0·1
1000			37·2	37·4	−0·2			37·7	37·7	0·0
800			37·7	37·7	0·0			37·8	37·9	−0·1
600			38·2	38·0	+0·2			38·0	38·0	0·0
400			38·2	38·3	−0·1			38·2	38·2	0·0
200			......	......	......			38·3	38·3	0·0
0			......	......	......			38·4	38·5	−0·1

December 30.—The temperature of the air was 42½° on the ground; it declined 1° in the first 200 feet; 0°·7 in the second; 0°·9 in the third; 1°·0 in the fourth; 1°·2 in the fifth, where it was 37°·8, or nearly 5° less than on the ground; it then decreased by amounts varying from ½° to 1° in every 200 feet, till 2400 feet had been passed, where the temperature was 32½°, declining to 32⅓° at 2600 feet. The balloon then turned to descend, the temperature remaining at nearly the same value, viz. 32°, for 400 feet, and increased ½° on falling to 2000 feet, when the balloon turned to ascend, the temperature decreasing very evenly up to 3400 feet: here a warm current was met with; for the temperature increased 2½° in passing from 3400 feet to 3600 feet, the temperature there being 29½°. On descending, the temperature decreased to 28½° at 3400 feet, and remained very nearly at that value for the next 800 feet, but increased to 29° at 2400 feet and to 30° at 2200 feet; after this it increased about ½° for every 200 feet, till the balloon had fallen to 1000 feet, and 1¼° whilst passing from that to 800 feet; the balloon then turned to reascend for the second time, the temperature remaining at 36° whilst passing upward from 800 feet to 1400 feet; it then declined about ½° in passing through the next 200 feet, and remained nearly at that value till 2400 feet were reached, and fell to 34¼° at 2800 feet, when the balloon turned to descend, the temperature increasing from 34° at 2800 feet to 38°·2 at 300 feet; on again ascending, the temperature did not vary until 600 feet was reached, but declined to 37°·2 at 1200 feet, and gradually increased to 38°·4 on the ground.

TABLE III. (*continued.*)

TWENTY-FIFTH ASCENT.

1865. February 27. Height, in feet, above the mean level of the sea.	Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temperature.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temperature.	Calculated effect of disturbance.
			°	°	°			°	°	°
5000	From 1h 52m p.m. to 2h 17m p.m.	Above Cloud.	39·4	33·4	+6·0	From 2h 22m 30s to 3h 12m p.m.		39·0		
4800			38·3	33·1	+5·2			38·4		
4600		In cloud.	34·0	33·2	+0·8			39·5		
4400			34·0	33·4	+0·6			42·1		
4200			34·3	33·6	+0·7			43·3		
4000			35·0	33·8	+1·2			43·1		
3800			34·8	34·1	+0·7			43·0		
3600			34·8	34·5	+0·3			42·8		
3400			35·1	35·1	0·0			42·5		
3200			35·8	35·8	0·0		On a level with cloud.	42·0		
3000		Below cloud.	37·2	36·9	+0·3			41·7		
2800			38·0	37·8	+0·2			41·7		
2600			39·4	38·7	+0·7		Below the level of the cloud.	41·2		
2400			40·4	39·6	+0·8			42·0		
2200			41·5	40·7	+0·8			43·0		
2000			42·8	41·7	+1·1			43·2		
1800			43·9	42·8	+1·1			43·2		
1600			44·9	43·7	+1·2			43·2		
1400			45·5	44·6	+0·9			43·2		
1200			45·8	45·6	+0·2			43·2		
1000			46·5	46·6	−0·1			43·6		
800			47·0	47·7	−0·7			43·7		
600			48·7	48·9	−0·2			45·3		
400			49·9	50·0	−0·1			45·7		
200			51·3	51·1	+0·2					
0			52·3	52·3	0·0					
								The balloon then turned to ascend.		
3600	From 3h 12m 30s to 3h 45m 40s p.m.	In cloud.	33·6	33·5	+0·1	From 3h 46m to 4h p.m.	In cloud.	32·7	32·7	0·0
3400			33·9	34·0	−0·1			32·6	32·8	−0·2
3200			34·2	34·8	−0·6			32·6	32·9	−0·3
3000		In haze.	35·7	35·4	+0·3		In cloud.	32·6	33·0	−0·4
2800			36·2	35·9	+0·3			32·6	33·1	−0·5
2600			36·7	36·5	+0·2			32·7	33·3	−0·6
2400			37·2	37·2	0·0		Below cloud.	33·5	33·5	0·0
2200			37·8	38·0	−0·2			34·4	34·0	+0·4
2000		Below cloud.	38·9	38·9	0·0			34·8	34·8	0·0
1800			40·0	39·8	+0·2			35·2	36·0	−0·8
1600			41·1	40·6	+0·5			37·0	37·2	−0·2
1400			42·3	41·4	+0·9			38·9	38·5	+0·4
1200			43·0	42·3	+0·7			40·4	39·9	+0·5
1000			43·7	43·2	+0·5			42·0	41·4	+0·6
800			44·3	44·0	+0·3			42·6	42·7	−0·1
600			44·9	44·8	+0·1			43·2	43·4	−0·2
400			45·7	45·7	0·0			44·1	44·1	0·0
200			......	......	......			44·5	44·5	0·0
0			......	......	......			44·5	44·5	0·0

February 27.—The temperature on the ground was 52°·3, which declined 1° on passing through the first 200 feet, and about $1\frac{1}{2}$° in each space of

200 feet up to 800 feet, where the temperature was 47° or 5°·3 lower than on the ground: the decline was then less rapid, for on passing through the next 800 feet the whole decrease was 2°·1. The temperature then declined rather more rapidly to 35°·1 at 3400 feet high; at 3600 feet it was $34\frac{3}{4}$°, and varied but little from this till 4000 feet had been passed; it then decreased to 34° at 4600 feet, when it suddenly became warm, the temperature increasing to $38\frac{3}{4}$° on passing above 4800 feet, and to $39\frac{1}{2}$° nearly on reaching 5000 feet, the same temperature having been passed at 2600 feet. The balloon then turned to descend, the temperature at first decreasing to 38°·4 at 4800 feet, being the same as noted on ascending: here a warm current was met with, and the temperature increased rapidly; when at 4200 feet it was 43°·3, being 9° warmer than was noticed at the same elevation on ascending; this excess gradually diminished, till at about 2000 feet high the temperature observed during the descent was very nearly the same as noted during the ascent; and below this the temperatures were all lower by some degrees than were recorded at the same elevation during the ascent: these differences seem to be chiefly owing to the presence of cloud situated between 3100 feet and 4100 feet high, or 1000 feet in thickness passed through in ascending, and seen at the same level, but not passed through in descending. The point where the temperatures noted were the same ascending and descending was a little below the cloud-plane; at lower elevations, to the ground, the air was some degrees warmer under the cloud, during the ascent, than in the absence of cloud during the descent. The effect of the presence of the cloud in this ascent seems to have been to cool the air several degrees; and this cooling influence seems to have extended for nearly 1000 feet above the cloud, and for 500 or 600 feet below; nearer the earth the presence of the cloud seems to have exercised a warming influence. In the descent it will be seen that the temperature differed very little from 43°, from 4200 feet high to 1000 feet high, the depression to 41°+ from 3000 feet to 2600 feet being evidently influenced by the passage through the cloud-plane. On ascending again, first haze was passed through, then cloud entered, giving readings differing but little from those met with in the first ascent. On descending to the earth, temperatures a little lower, owing apparently to the diurnal decrease of temperature at these altitudes, were met with, thus far agreeing with those during the first ascent; and comparison with those during the first descent through a large break in the clouds gives a great deal of information upon the large influence exercised by the presence of cloud.

In previous Reports a Table (No. IV.) was formed here, showing the decrease of temperature in every 1000 feet; as no additional information at high elevations is given this year, this Table has not been formed. The results of Table V. of preceding years are included in Table III. of this year.

TABLE VI.—Showing the Decrease of Temperature with every Increase of 100 feet up to 5000 feet.

Height, in feet, above the level of the sea. From	To	Dec. 1, 1864. Generally clear. Ascending.	Descending.	Dec. 30, 1864. Cloudy. Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.
feet.	feet.	°	°	°	°	°	°	°	°	°	°
4900	5000	0·5	0·1	..	..	..	..	..	..	..	..
4800	4900	0·6	0·1	..	..	..	..	..	..	..	..
4700	4800	0·4	0·1	..	..	..	..	..	..	..	..
4600	4700	0·4	0·1	..	..	..	..	..	..	..	..
4500	4600	0·7	0·1	..	..	..	..	..	..	..	..
4400	4500	0·8	0·2	..	..	..	..	..	..	..	..
4300	4400	0·5	0·2	..	..	..	..	..	..	..	..
4200	4300	0·6	0·2	..	..	..	..	..	..	..	..
4100	4200	0·5	0·2	..	..	..	..	..	..	..	..
4000	4100	0·4	0·3	..	..	..	..	..	..	..	..
3900	4000	0·4	0·2	..	..	..	..	..	..	..	..
3800	3900	0·4	0·2	..	..	..	..	..	..	..	..
3700	3800	0·4	0·2	..	..	..	..	..	..	..	..
3600	3700	0·3	0·1	..	..	..	..	..	..	..	..
3500	3600	0·3	0·1	..	..	+1·0	+0·4	..	..	..	..
3400	3500	0·3	0·2	..	..	+1·1	+0·5	..	..	..	..
3300	3400	0·3	0·2	..	..	0·1	0·0	..	..	..	..
3200	3300	0·2	0·2	..	..	0·3	0·0	..	..	..	..
3100	3200	0·2	0·2	..	..	0·4	0·0	..	..	..	..
3000	3100	0·3	0·3	..	..	0·5	+0·1	..	..	..	..
2900	3000	0·3	0·3	..	..	0·5	+0·1	..	..	..	..
2800	2900	0·3	0·2	..	..	0·5	0·0	..	..	..	..
2700	2800	0·3	0·2	..	..	0·5	0·1	0·2	0·3	..	..
2600	2700	0·4	0·2	..	..	0·5	0·2	0·3	0·4	..	..
2500	2600	0·4	0·2	0·2	0·0	0·4	0·3	0·2	0·1	..	..
2400	2500	0·3	0·3	0·3	0·1	0·3	0·3	0·2	0·1	..	..
2300	2400	0·4	0·3	0·3	0·1	0·4	0·3	0·0	0·1	..	..
2200	2300	0·4	0·4	0·3	0·0	0·5	0·4	0·0	0·0	..	..
2100	2200	0·4	0·5	0·3	0·2	0·4	0·4	0·1	0·0	..	..
2000	2100	0·3	0·6	0·4	0·3	0·5	0·4	0·2	0·1	..	..
1900	2000	0·3	0·6	0·5	..	..	0·3	0·0	0·1	..	..
1800	1900	0·4	0·6	0·5	..	..	0·2	0·0	0·0	..	..
1700	1800	0·3	0·5	0·4	..	..	0·2	0·0	0·0	..	..
1600	1700	0·3	0·4	0·4	..	..	0·3	0·0	0·1	..	..
1500	1600	0·3	0·5	0·3	..	..	0·3	0·1	0·1	..	..
1400	1500	0·3	0·6	0·2	..	..	0·2	0·1	0·0	..	..
1300	1400	0·3	0·6	0·4	..	..	0·2	0·1	0·0	..	..
1200	1300	0·3	0·5	0·4	..	..	0·2	0·1	0·1	..	..
1100	1200	0·3	0·4	0·4	..	..	0·3	0·0	0·1	0·1	0·0
1000	1100	0·2	0·4	0·3	..	..	0·3	0·0	0·0	0·1	0·1
900	1000	0·2	0·3	0·7	..	..	0·5	+0·1	0·1	0·1	0·1
800	900	0·3	0·2	0·7	..	..	0·6	0·0	0·1	0·2	0·1
700	800	0·2	0·3	0·5	..	..	..	..	0·1	0·1	0·1
600	700	0·2	0·3	0·4	..	..	..	..	0·2	0·2	0·0
500	600	0·2	0·3	0·5	..	..	..	..	0·4	0·1	0·1
400	500	0·1	0·3	0·5	..	..	..	..	0·4	0·2	0·1
300	400	0·1	0·3	0·4	..	..	..	..	..	..	0·1
200	300	0·0	0·4	0·3	..	..	..	..	..	..	0·0
100	200	0·0	0·4	0·5	..	..	..	..	..	..	0·1
0	100	0·0	0·4	0·5	..	..	..	..	..	..	0·1
No. of col. 1.		2.	3.	4.	5.	6.	7.	8.	9.	10.	11.

From	To	Feb. 27, 1865. Cloudy. Ascending.	Ascending.	Descending.	Mean. Cloudy.	Number of experiments.	Clear.	Number of experiments.	General mean (omitting July 17, 1862, August 31, 1863, January 12, April 6, July 13, 20, 27, 1864, and February 27, 1865). Cloudy. Mean.	Number of experiments.	Space passed through for a decline of 1°.	Clear. Mean.	Number of experiments.	Space passed through for a decline of 1°.
feet.	feet.	°	°	°	°		°		°		feet.	°		feet.
4900	5000	..	..	..	..	..	0·3	2	0·3	20	333	0·3	12	333
4800	4900	..	..	..	..	..	0·3	2	0·3	20	333	0·3	12	333
4700	4800	0·0	..	..	0·0	1	0·3	2	0·3	20	333	0·3	12	333
4600	4700	0·1	..	..	0·1	1	0·3	2	0·3	20	333	0·3	12	333
4500	4600	0·1	..	..	0·1	1	0·4	2	0·3	21	333	0·3	12	333
4400	4500	0·1	..	..	0·1	1	0·5	2	0·3	21	333	0·3	12	333
4300	4400	0·1	..	..	0·1	1	0·4	2	0·3	24	333	0·3	12	333
4200	4300	0·1	..	..	0·1	1	0·4	2	0·3	24	333	0·3	12	333
4100	4200	0·1	..	..	0·1	1	0·4	2	0·3	24	333	0·3	14	333
4000	4100	0·1	..	..	0·1	1	0·4	2	0·3	25	333	0·3	14	333
3900	4000	0·1	..	..	0·1	1	0·3	2	0·3	25	333	0·3	14	333
3800	3900	0·2	..	..	0·2	2	0·3	2	0·3	26	333	0·3	14	333
3700	3800	0·2	..	..	0·2	2	0·3	2	0·3	27	333	0·3	13	333
3600	3700	0·2	..	..	0·2	2	0·2	2	0·3	27	333	0·3	13	333
3500	3600	0·3	0·2	0·0	0·2	3	0·2	2	0·3	28	333	0·3	13	333
3400	3500	0·3	0·3	0·1	0·2	3	0·2	2	0.3	28	333	0·3	13	333
3300	3400	0·3	0·4	0·1	0·2	3	0·2	2	0.3	28	333	0·3	13	333
3200	3300	0·4	0·4	0·0	0·2	5	0·2	2	0·3	30	333	0·3	13	333
3100	3200	0·5	0·3	0·0	0·2	5	0·2	2	0·3	31	333	0·3	12	333
3000	3100	0·6	0·3	0·1	0·3	4	0·2	2	0·4	30	250	0·3	12	333
2900	3000	0·5	0·3	0·1	0·3	4	0·3	2	0·4	31	250	0·3	12	333
2800	2900	0·4	0·2	0·0	0·2	5	0·3	2	0·4	31	250	0·3	12	333
2700	2800	0·4	0·3	0·1	0·3	7	0·3	2	0·4	34	250	0·3	12	333
2600	2700	0·5	0·3	0·1	0·3	7	0·3	2	0·4	34	250	0·3	12	333
2500	2600	0·5	0·3	0·1	0·2	9	0·3	2	0·4	37	250	0·3	12	333
2400	2500	0·4	0·4	0·1	0·2	9	0·3	2	0·4	37	250	0·3	12	333
2300	2400	0·4	0·4	0·2	0·2	9	0·3	2	0·4	36	250	0·3	12	333
2200	2300	0·5	0·4	0·3	0·3	9	0·3	2	0·4	36	250	0·3	12	333
2100	2200	0·5	0·4	0·4	0·3	9	0·4	2	0·4	36	250	0·3	12	333
2000	2100	0·5	0·5	0·4	0·4	9	0·4	2	0·4	36	250	0·3	12	333
1900	2000	0·5	0·5	0·6	0·4	7	0·4	2	0·4	34	250	0·3	12	333
1800	1900	0·6	0·4	0·6	0·3	7	0·4	2	0·4	34	250	0·3	12	333
1700	1800	0·6	0·4	0·6	0·3	7	0·5	2	0·4	36	250	0·3	12	333
1600	1700	0·5	0·4	0·6	0·3	7	0·4	2	0·4	36	250	0·3	12	333
1500	1600	0·5	0·4	0·6	0·3	7	0·4	2	0·4	38	250	0·4	13	250
1400	1500	0·6	0·4	0·7	0·3	7	0·4	2	0·4	38	250	0·4	13	250
1300	1400	0·5	0·4	0·7	0·3	7	0·4	2	0·4	35	250	0·4	10	250
1200	1300	0·5	0·5	0·7	0·4	7	0·4	2	0·4	35	250	0·5	10	200
1100	1200	0·5	0·5	0·7	0·3	9	0·4	2	0·4	37	250	0·5	10	200
1000	1100	0·5	0·4	0·8	0·3	9	0·3	2	0·4	37	250	0·5	10	200
900	1000	0·5	0·4	0·7	0·3	9	0·3	2	0·4	33	250	0·5	10	200
800	900	0·6	0·4	0·6	0·4	9	0·3	2	0·4	33	250	0·5	10	200
700	800	0·6	0·4	0·4	0·3	7	0·3	2	0·4	29	250	0·5	10	200
600	700	0·6	0·4	0·3	0·3	7	0·3	2	0·4	29	250	0·5	10	200
500	600	0·5	0·4	0·3	0·3	7	0·3	2	0·5	27	200	0·5	10	200
400	500	0·6	0·5	0·4	0·4	7	0·2	2	0·5	27	200	0·4	10	250
300	400	0·6	..	0·2	0·3	4	0·2	2	0·5	24	200	0·4	10	250
200	300	0·5	..	0·1	0·2	4	0·2	2	0·5	24	200	0·5	10	200
100	200	0·6	..	0·0	0·3	4	0·2	2	0·5	24	200	0·5	10	200
0	100	0·6	..	0·0	0·3	4	0·2	2	0·6	24	167	0·6	10	167
		12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.

§ 6. Variation of the Hygrometric Condition of the Air with Elevation.

All the adopted readings of the temperature of the dew-point in Section 4 were laid down on diagrams, and joined by lines drawn from one to the other. In the case of the temperature of the air, when thus joined, a curved line can be drawn through them, giving equal weight to every observation; but this cannot be done with respect to the temperature of the dew-point, it being far more variable than the temperature of the air; and the numbers in the following Table are those read at every 200 feet, from the diagram formed simply by joining the points of observation.

Table VII.—Showing the Variation of the Hygrometric condition of the Air at every 200 feet of Height.

Twenty-third Ascent.

1864. December 1.	Humidity of the Air.									
	Ascending.					Descending.				
Height, in feet, above the mean level of the sea.	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
			°	in.				°	in.	
5400	From $2^h 30^m$ to $3^h 42^m$ p.m.	Generally clear.	15·0	·086	53	From $3^h 43^m$ to $4^h 33^m$ p.m.	Generally clear.	15·3	·087	54
5200			13·0	·078	45			16·9	·093	57
5000			12·1	·074	42			18·4	·100	60
4800			14·4	·083	45			18·5	·100	58
4600			17·8	·097	50			18·7	·101	59
4400			20·4	·110	55			19·1	·103	59
4200			22·0	·118	54			19·3	·104	58
4000			23·7	·127	57			19·6	·106	57
3800			25·7	·139	59			17·5	·096	52
3600			28·5	·156	65			15·9	·089	48
3400			29·3	·162	66			19·4	·105	58
3200			29·6	·164	66			23·0	·123	66
3000			29·6	·164	66			26·7	·145	86
2800			29·6	·164	62			27·9	·152	79
2600			30·1	·168	65			30·5	·170	83
2400			35·0	·204	76			30·9	·173	83
2200			37·6	·225	81			31·4	·176	82
2000			36·9	·219	79			31·8	·179	82
1800			36·5	·216	76			32·5	·184	83
1600			36·9	·219	72			34·7	·201	87
1400			37·1	·221	72			36·8	·218	83
1200			37·6	·225	72			37·2	·222	86
1000			38·6	·234	73			39·0	·238	93
800			38·8	·236	73			39·3	·240	91
600			38·5	·233	75			39·5	·242	89
400			39·5	·242	72			39·9	·246	88
200			39·5	·242	72			40·2	·249	82
0			40·0	·247	74			40·5	·252	83

December 1.—The temperature of the dew-point on the ground before starting was 40°, or 8° below that of the air; this difference slightly increased to $8\frac{2}{3}$° at 1600 feet, when the air became more moist, the temperature of the air at 2200 feet being 43°, and that of the dew-point $37\frac{1}{2}$°; these temperatures then separated suddenly, the difference between them at 2600 feet being rather more than 11°; this difference remained about the same until 3600 feet were passed, when it began to increase quickly up to 5000 feet, where it was 19°, the temperatures of the air and dew-point being 31°·1 and 12°·1 respectively, the degree of humidity being as low as 42. The air then became somewhat more moist, and the degree of humidity increased to 53 at 5400 feet; at 5000 feet, on descending, the temperature of the air was 30°, and that of the dew-point 18°·4, showing a difference of 11°·6, which increased gradually to $12\frac{3}{4}$° at 4000 feet; the air then suddenly became much drier, the degree of humidity being 48 at 3600 feet, and the difference between the temperatures of the air and dew-point was $16\frac{1}{2}$°. The air then became much more moist, and continued so till the ground was reached. The most humid state was experienced at the height of 1000 feet from the earth.

Table VII. (*continued*).

Twenty-fourth Ascent.

1864. December 30.	Humidity of the Air.									
	Ascending.					Descending.				
Height, in feet, above the mean level of the sea.	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
			°	in.				°	in.	
2600	From $2^h 12^m$ to $2^h 23^m 30^s$ p.m.	Just out of cloud.	30·0	·167	91	From $2^h 24^m$ to $2^h 27^m 15^s$ p.m.	Approaching cloud.	27·2	·148	83
2400		Entered cloud.	30·7	·172	94			28·6	·137	76
				...	...					
2200		Approaching cloud.	30·0	·167	89			30·2	·168	93
2000			30·8	·172	88			30·5	·170	92
								The balloon then turned to ascend.		
1800			30·9	·173	86	...				
1600			31·0	·174	84					
1400			31·1	·174	82					
1200			31·3	·176	81					
1000			31·4	·176	77					
800			31·6	·178	75					
600		Misty.	31·5	·177	72					
400			32·2	·182	71					
200			33·5	·192	73					
0			34·9	·203	74					
3600	From $2^h 28^m$ to $2^h 32^m 15^s$ p.m.	Above cloud, sun dazzlingly bright.	14·4	·083	51	From $2^h 33^m$ to $2^h 39^m$ p.m.	Above cloud.	18·0	·098	62
							In very dense cloud.			
3400			23·6	·127	86			22·6	·121	78
3200		In dense cloud.	26·0	·141	94			22·9	·122	92
3000			26·5	·144	91			24·4	·131	85
2800			27·5	·150	92			25·6	·139	91
2600		Just entering cloud.	28·7	·158	91		Out of cloud.	27·1	·148	96
2400			30·1	·168	96			27·6	·151	95
2200			32·2	·182	100			28·4	·156	94
2000			30·5	·170	92			28·7	·158	92
1800								29·0	·160	92
1600								20·1	·160	90
1400								29·4	·162	90
1200								29·8	·166	90
1000								30·0	·167	89
800								30·0	·167	85
								The balloon then turned to ascend.		

TABLE VII. (*continued*).

TWENTY-FOURTH ASCENT (*continued*).

1864. Dec. 30 (*cont.*)	Humidity of the Air.									
	Ascending.					Descending.				
Height, in feet, above the mean level of the sea.	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
			°	in.				°	in.	
2800	From 2^h 40^m to 2^h 47^m 20^s p.m.	Below cloud.	29·8	·166	84	From 2^h 48^m to 2^h 57^m p.m.	Below cloud.	30·0	·167	85
2600			29·5	·163	80			30·4	·170	83
2400			29·8	·166	80			30·1	·168	83
2200			29·7	·165	80			30·1	·168	82
2000			30·0	·167	80			30·5	·170	83
1800			30·9	·173	83			30·5	·170	82
1600			31·2	·175	84			30·5	·170	82
1400			30·7	·172	81			30·5	·170	82
1200			30·7	·172	81			30·9	·173	82
1000			30·7	·172	81			30·7	·172	81
800			30·8	·172	82			30·2	·168	79
600			...	...	...			29·6	·164	77
400			...	...	...			33·5	·192	86
								The balloon then turned to ascend.		
1200	From 2^h 57^m 30^s to 3^h 2^m p.m.	Below cloud.	34·5	·199	90	From 3^h 2^m 30^s to 3^h 15^m p.m.	Below cloud.	34·1	·196	87
1000			34·6	·200	90			34·0	·196	87
800			34·9	·203	91			33·8	·194	86
600			35·0	·204	89			33·9	·195	85
400			35·0	·204	89			33·8	·194	84
200			...	...	...			33·6	·193	84
0			...	...	...			34·4	·199	86

December 30.—The temperature of the dew-point on the ground was 34°·9, and the humidity 74, the former decreasing to 31½° at 600 feet, where the humidity was 72; the dew-point then varied but little, and much less than the temperature of the air, so that the degree of humidity increased to the height of 2400 feet, then was smaller at 2600 feet. The balloon descended then to 2000 feet, then turned to ascend; the air continued humid till 3200 feet was passed; the degree of humidity at this point was 94; above this point the air was much drier. During the subsequent successive ascents and descents the air in the lower atmosphere was found to be very humid.

February 27.—The temperature of the dew-point on the earth was 38°, or 14°·3 below that of the air, the air being consequently unusually dry, and particularly so for February, the degree of humidity being 59 only. On ascending, the air gradually became more moist, till the height of 3200 feet in the centre of cloud, where the degree of humidity was 78. On leaving the cloud below, the air became drier, and was the driest at 5000 feet high, where it was 37. On descending, the air was much drier down to 2600 feet than at corresponding heights during the ascent. No cloud was passed through, and at lower elevations the air was more moist than in the ascent. On ascending again through cloud, and descending also through cloud, the results were very similar to those noted in the first ascent, the most humid states being those in the cloud, which in the last descent were found but little short of saturation.

TABLE VII. (*continued.*)

TWENTY-FIFTH ASCENT.

1865. February 27.	Humidity of the Air.									
	Ascending.					Descending.				
Height, in feet, above the mean level of the sea.	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
			°	in.				°	in.	
5000	From 1^h 52^m to 2^h 17^m p.m.	Above cloud.	15·8	·089	37	From 2^h 22^m 30^s to 3^h 12^m p.m.		15·8	·089	37
4800			20·0	·108	47			16·4	·091	39
4600		In cloud.	18·3	·099	51			18·1	·098	41
4400			18·5	·100	52			19·4	·105	39
4200			22·0	·118	60			20·5	·110	41
4000			26·7	·145	71			21·8	·117	42
3800			27·5	·150	74			23·7	·127	46
3600			27·6	·151	75			25·5	·138	50
3400			28·7	·158	77			27·4	·149	55
3200			29·3	·162	78		On a level with clouds.	28·6	·157	59
3000		Below cloud.	29·6	·164	74			28·8	·158	60
2800			29·7	·165	72			29·0	·160	61
2600			30·0	·167	69		Below the level of cloud.	30·4	·170	66
2400			31·2	·175	69			32·6	·185	69
2200			32·2	·182	69			34·9	·203	73
2000			32·7	·186	68			33·9	·195	70
1800			33·3	·190	66			33·8	·194	70
1600			33·8	·194	65			33·7	·193	69
1400			33·8	·194	64			33·5	·192	69
1200			33·4	·191	62			33·4	·191	69
1000			33·4	·191	60			34·5	·199	70
800			33·7	·193	60			34·0	·196	69
600			34·0	·196	57			34·4	·199	66
400			34·7	·201	57			35·3	·206	67
200			37·6	·225	60			The balloon then turned to ascend.		
0			38·0	·229	59					
3600	From 3^h 12^m 30^s to 3^h 45^m 40^s p.m.	In cloud.	30·0	·167	87	From 3^h 46^m to 4^h 0^m p.m.	In cloud.	30·5	·170	91
3400			28·6	·157	81			30·9	·173	94
3200		In haze.	28·5	·156	80			30·2	·168	91
3000			29·7	·165	79			31·0	·174	94
2800			30·0	·167	78		In cloud.	31·0	·174	94
2600			30·3	·169	78			31·9	·180	97
2400			31·0	·174	79			31·4	·176	92
2200			30·9	·173	77		Below cloud.	31·0	·174	87
2000		Below cloud.	31·3	·176	74			30·1	·168	83
1800			31·2	·175	71			29·2	·161	79
1600			31·3	·176	68			30·0	·167	78
1400			31·4	·176	65			31·0	·174	74
1200			32·0	·181	66			32·0	·181	72
1000			32·7	·186	65			33·1	·188	71
800			33·4	·191	66			33·8	·194	71
600			34·0	·196	66			34·4	·199	72
400			34·8	·202	66			36·0	·212	74
200								36·6	·217	74
0								37·3	·223	76

The numbers in this Table having been found from experiments taken at different times in the year, and under different circumstances from those in previous years, can scarcely be combined with them, till we know more about

the general laws at the different seasons of the year. I defer for the present making any further use of them, particularly as their combination would not change the general Tables previously found.

Table VIII.—Showing the Degree of Humidity at every 200 feet.

Height above the level of the sea.	Dec. 1, 1864.		December 30, 1864.								February 27, 1865.				Mean.			
	State of the Sky.																	
	Generally Clear.		Cloudy.								Cloudy.	Generally Cloudy.		Cloudy.				
	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Cloudy.	Number of experiments.	Clear.	Number of experiments.
feet.																		
5400	53	54	...	...	...	...	...	...	...	...	...	...	...	...	...	...	53	2
5200	45	57	...	...	...	...	...	...	...	...	...	...	...	...	...	...	51	2
5000	42	60	...	...	...	...	...	...	...	...	37	37	...	...	37	2	51	2
4800	45	58	...	...	...	...	...	...	...	...	47	39	...	...	43	2	51	2
4600	50	59	...	...	...	...	...	...	...	...	51	41	...	...	46	2	54	2
4400	55	59	...	...	...	...	...	...	...	...	52	39	...	...	46	2	57	2
4200	54	58	...	...	...	...	...	...	...	...	60	41	...	...	50	2	56	2
4000	57	57	...	...	...	...	...	...	...	...	71	42	...	...	56	2	57	2
3800	59	52	...	...	...	...	...	...	...	...	74	46	...	...	60	2	55	2
3600	65	48	...	...	51	62	...	...	...	...	75	50	87	91	69	6	56	2
3400	66	58	...	...	86	78	...	...	...	...	77	55	81	94	78	6	62	2
3200	66	66	...	...	94	92	...	...	...	...	78	59	80	91	82	6	66	2
3000	66	86	...	...	91	85	...	...	...	...	74	60	79	94	80	6	76	2
2800	62	79	...	...	92	91	84	85	...	...	72	61	78	94	82	8	70	2
2600	65	83	91	83	91	96	80	83	...	...	69	66	78	97	83	10	74	2
2400	76	83	94	76	96	95	80	83	...	...	69	69	79	92	82	10	79	2
2200	81	82	89	93	100	94	80	82	...	...	69	73	77	87	84	10	81	2
2000	79	82	88	92	92	92	80	83	...	...	68	70	74	83	82	10	80	2
1800	76	83	86	...	...	92	83	82	...	...	66	70	71	79	79	8	80	2
1600	72	87	84	...	...	90	84	82	...	...	65	69	68	78	77	8	79	2
1400	72	83	82	...	...	90	81	82	...	...	64	69	65	74	76	8	78	2
1200	72	86	81	...	...	90	81	82	90	87	62	69	66	72	78	10	79	2
1000	73	93	77	...	...	89	81	81	90	87	60	70	65	71	77	10	83	2
800	73	91	75	...	...	85	82	79	91	86	60	69	66	71	76	10	82	2
600	75	89	72	...	...	...	...	77	89	85	57	66	66	72	73	8	82	2
400	72	88	71	...	...	...	...	76	89	84	57	67	66	74	73	8	80	2
200	72	82	73	...	...	...	...	...	...	84	60	...	...	74	72	4	77	2
0	74	83	74	...	...	...	...	...	...	86	59	...	...	76	72	4	78	2
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.

The numbers in this Table show, as in all similar experiments at all times in the year, that the moisture in the air is very different at the same elevation at different times; and that the moisture on the same day was differently distributed over different places. The most remarkable in this Table is that of the first descent on February 27, the balloon having ascended through clouds, descended through a break in the clouds, and then ascended and descended again through clouds, showing a marked difference at the same elevation in the degree of humidity of the air. These results are too few, and having been deduced from experiments made at a different season of the year from those previously made, had better be left till more winter ascents have been made to combine with them.

§ 7. Comparison of the Temperature of the Dew-point, as determined by different Instruments and Methods, and Comparison of their Results together.

Table IX.—Showing the Temperature of the Dew-point, as determined at about the same height by different instruments and methods, and comparison of the results together.

Under 1000 feet.

Date.	Height.	Dew-point temperatures. Calculated from: Dry and Wet (free).	Dew-point temperatures. Calculated from: Dry and Wet (aspirated).	Dew-point temperatures. Observed by: Daniell's Hygrometer.	Dew-point temperatures. Observed by: Regnault's Hygrometer.	Temperature of the dew-point as determined by Dry and Wet (free) above that by: Dry and Wet (aspirated).	Dry and Wet (free) above that by: Daniell's Hygrometer.	Dry and Wet (free) above that by: Regnault's Hygrometer.	Dry and Wet (aspirated) above that by: Daniell's Hygrometer.	Dry and Wet (aspirated) above that by: Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
d h m	feet.	°	°	°	°	°	°	°	°	°	°
Dec. 1 0 0	ground	40·4	..	40·2	..	..	+0·2				
1 15	ground	39·1	..	40·0	..	..	−0·9				
2 30	ground	40·0	..	40·0	40·0	..	0·0	0·0			
Dec. 30 2 55	565	32·1	..	..	32·5	..	..	−0·4			
Feb. 27 1 52	ground	38·0	..	..	34·2	..	..	+3·8			
2 58	957	34·7	..	35·0	..	..	−0·3				
3 6	605	33·8	..	34·0	..	..	−0·2				
3 10	377	34·4	..	..	32·0	..	..	+2·4			
3 14	779	34·0	..	34·0	..	..	0·0				
3 24	742	33·2	..	34·0	..	..	−0·8				

From 1000 to 2000 feet.

Dec. 30 2 51¾	1256	30·8	..	..	30·5	..	..	+0·3			
Feb. 27 3 18	1148	33·3	..	..	33·0	..	..	+0·3			

From 2000 to 3000 feet.

Dec. 1 3 57	2662	28·5	..	28·0	..	..	+0·5				
4 0	2691	30·7	..	30·0	..	..	+0·7				
Dec. 30 2 22	2634	30·0	..	..	28·0	..	..	+2·0			
2 44	2219	29·6	..	30·0	..	..	−0·4				
Feb. 27 2 47	2382	33·1	..	..	33·0	..	..	+0·1			
2 49	2330	33·3	..	34·0	..	..	−0·7				
3 35	2271	31·9	..	30·5	..	..	+1·4				

TABLE IX. (*continued*).

From 3000 to 4000 feet.

Date.	Height.	Dew-point temperatures. Calculated from: Dry and Wet (free).	Dew-point temperatures. Calculated from: Dry and Wet (aspirated).	Dew-point temperatures. Observed by: Daniell's Hygrometer.	Dew-point temperatures. Observed by: Regnault's Hygrometer.	Temperature of the dew-point as determined by Dry and Wet (free) above that by: Dry and Wet (aspirated).	Temperature of the dew-point as determined by Dry and Wet (free) above that by: Daniell's Hygrometer.	Temperature of the dew-point as determined by Dry and Wet (free) above that by: Regnault's Hygrometer.	Dry and Wet (aspirated) above that by: Daniell's Hygrometer.	Dry and Wet (aspirated) above that by: Regnault's Hygrometer.	Daniell's Hygrometer above that by Regnault's.
d h m	feet.	°	°	°	°	°	°	°	°	°	°
Dec. 1 3 46	3470	22·5	..	21·5	..	..	+1·0				
3 52	3744	20·0	..	20·0	..	..	0·0				
3 54	3240	24·7	..	25·0	..	..	−0·3				
Dec. 30 2 33	3735	12·2	..	15·0	14·0	..	−2·8	−1·8			
Feb. 27 3 45	3521	30·0	..	30·5	..	..	−0·5				
3 46	3415	31·0	..	30·7	..	..	+0·3				
3 48	3042	31·0	..	..	30·5	..	..	+0·5			
From 4000 to 5000 feet.											
Dec. 1 2 50	4222	23·8	..	20·0	..	..	+3·8				
3 5	4496	15·6	..	15·0	..	..	+0·6				
3 14	4766	22·0	..	16·0	..	..	+6·0				
3 17	4951	16·5	..	19·0	..	...	−2·5				
3 49	4170	15·0	..	..	15·0	..	..	0·0			
Feb. 27 2 7½	4418	20·9	..	18·5	..	..	+2·4				
2 11	4737	21·6	..	..	19·0	..	..	+2·6			
2 17	4965	16·1	..	15·0	..	..	+1·1				
2 27	4828	13·0	..	..	15·0	..	..	−2·0			
2 34	4408	16·7	..	17·0	..	..	−0·3				
2 34½	4408	17·7	..	..	16·0	..	..	+1·7			
From 5000 to 6000 feet.											
Dec. 1 2 58	5328	12·2	..	17·0	..	..	−4·8				

TABLE X.

Heights between	Excess of Temperature of the Dew-point as determined by Dry and Wet Thermometers (free) above that observed by: Daniell's Hygrometer.	No. of obs.	Regnault's Hygrometer.	No. of obs.
feet. feet.	°		°	
0 and 1000	−0·3	7	+1·4	4
1000 „ 2000	....	..	+0·3	2
2000 „ 3000	+0·5	5	+1·0	2
3000 „ 4000	−0·4	6	−0·6	2
4000 „ 5000	+1·6	7	+0·6	4
5000 „ 6000	−4·8	1		

TABLE XI.—Simultaneous readings of a delicate blackened-bulb thermometer fully exposed to the sun's rays, and of a delicate thermometer carefully shaded from the influence of the sun, the bulbs of the two instruments being within 3 inches of each other.

December 1, 1864.

Time of observation.	Height above mean sea-level.	Temperature of Shaded Thermometer.	Temperature of Blackened-bulb Thermometer.	Excess of reading of Blackened-bulb Thermometer.	Remarks.
h m s	feet.	°	°	°	
......	ground.	46·2	56·0	+9·8	Sun shining.
1 15 0 p.m.	ground.	46·8	56·0	+9·2	
2 39 0 „	890	47·2	47·0	−0·2	Sun shining brightly.
41 0 „	1618	45·0	44·5	−0·5	Sun shining brightly.
46 0 „	3570	39·5	40·0	+0·5	Sun warm.
51 0 „	4324	38·0	39·0	+1·0	
55 0 „	4742	35·0	35·5	+0·5	
3 5 0 „	4496	31·2	33·0	+1·8	
9 0 „	4128	33·5	29·5	−4·0	
14 0 „	4766	32·2	31·5	−0·7	
17 0 „	4951	31·0	31·0	0·0	
24 0 „	5122	29·8	30·0	+0·2	
48 0 „	3973	33·0	33·0	0·0	

December 30, 1864.

2 34 30 p.m.	3589	29·0	29·0	0·0	
39 0 „	797	34·5	34·5	0·0	
42 0 „	1669	35·5	35·5	0·0	
43 0 „	1929	35·5	35·5	0·0	

February 27, 1865.

1 58 0 p.m.	ground	..	52·0		
58 20 „	176	51·4	52·0	+0·6	
59 0 „	474	49·5	51·5	+2·0	Sun shining faintly.
2 6 30 „	4040	34·8	35·0	+0·2	
28 0 „	4847	38·1	38·3	+0·2	
40 0 „	4734	41·2	45·0	+3·8	Sun hot to sense.
......	..	42·0	43·5	+1·5	
42 0 „	4332	42·0	43·5	+1·5	
45 0 „	3274	42·0	42·5	+0·5	
49 0 „	2330	41·8	41·0	−0·8	
56 30 „	644	46·0	46·0	0·0	

December 1, 1864.

Observations of the time of vibration of Evans's Magnet and Glaisher's Magnet.

1864.		Place of observation.	Height above sea-level.	Evans's and Glaisher's Magnet.					
				No. of vibrations in each set.	Time occupied in each set.	Arc of vibration. At commencement.	Arc of vibration. At end.	Mean time of vibration from each set of observations.	Magnet.
	h m		feet.		s	°	°	s	
Dec. 1.	2 48	In Balloon.	3600	28	45·2	..	..	1·614	Glaisher.
	2 52	”	4200	50	119·5	60	5	2·390	Evans.
	2 56	”	4800	20	50·0	100	..	2·500	”
	2 56+	”	4800	28	68·4	120	..	2·553	”
	3 1	”	5000	34	56·2	40	..	1·653	Glaisher.
	3 2	”	5000	10	23·2	10	..	2·320	Evans.
	3 7	”	4100	30	50·5	80	..	1·683	Glaisher.
	3 12	”	4300	40	93·3	60	..	2·333	Evans.
	3 16	”	4900	20	42·2	10	..	2·110	”
	3 20	”	5000	52	123·8	90	1	2·381	”
	3 30	”	4500	10	24·1	100	..	2·410	”
	3 37	”	5000	58	140·0	100	..	2·414	”
	3 47	”	3600	20	47·3	90	..	2·365	”
	12 0	Blackheath.	160	80	165·2	50	..	2·065	”
		”	..	60	124·4	50	..	2·073	”
		”	..	38	55·0	50	..	1·448	Glaisher.
		”	..	40	67·2	50	..	1·680	”
		”	..	20	32·2	50	..	1·610	”
Dec. 2.		Royal Observatory.	160	30	59·0	25	3	1·967	Evans.
		”	..	10	19·8	27	5	1·980	”
		”	..	40	81·9	113	38	2·047	”
		”	..	20	40·2	40	8	2·010	”
		”	..	10	15·3	80	2	1·530	Glaisher.
		”	..	30	47·3	160	30	1·577	”
		”	..	20	31·8	150	6	1·590	”
		”	..	10	15·5	140	10	1·550	”
		”	..	20	31·3	150	30	1·565	”
1865. Feb. 27.		In Balloon.	4900	40	89·9	100	20	2·247	Evans.
		”	4800	38	87·7	150	50	2·307	”
		South Hanningfield.	110	50	100·1	150	10	2·002	”
		”	..	50	100·0	140	10	2·000	”

Heights and Appearance of the Clouds.

December 1, 1864.

Before starting the sky was cloudy.

At $3^h\ 50^m$ p.m., at 3968 feet, the setting sun illuminated the topmost part of a dark stratus cloud with a very deep orange-colour; not a cloud in the sky above altitude 15°.

December 30, 1864.

At $2^h\ 15^m$ p.m., at 602 feet. Misty all round.

At $2^h\ 19^m\ 45^s$ p.m., at 2355 feet. Approaching cloud.

At $2^h\ 21^m$ p.m., at 2532 feet. Entered cloud.

At $2^h\ 23^m\ 30^s$ p.m., at 2699 feet. Just out of cloud.

At $2^h\ 28^m$ p.m., at 2215 feet. Approaching cloud.

At $2^h\ 28^m\ 30^s$ p.m., at 2552 feet. Just entering cloud.

At $2^h\ 28^m\ 45^s$ p.m., at 2687 feet. Passed into cloud and lost sight of everything.

At $2^h\ 30^m$ p.m., at 3228 feet. Cloud dense and cold.

At $2^h\ 31^m$ p.m., at 3424 feet. The sky was of a beautiful prussian-blue colour, with a beautiful sea of cloud below of varied surface, bright and shining.

At $2^h\ 34^m\ 40^s$ p.m., at 3550 feet. In a very dense cloud.

At $2^h\ 35^m\ 30^s$ p.m., at 2570 feet. Out of cloud below.

February 27, 1865.

At $2^h\ 3^m\ 30^s$ p.m., at 3074 feet. In cloud.

At $2^h\ 4^m$ p.m., at 3333 feet. In a white cloud.

At $2^h\ 5^m\ 30^s$ p.m., at 3850 feet. We are in cloud: the clouds below are moving much more quickly than we are.

At $2^h\ 7^m\ 30^s$ p.m., at 4418 feet. The clouds below appear to be moving N.

At $2^h\ 8^m\ 30^s$ p.m., at 4647 feet. The clouds below are moving at right angles to us.

At $2^h\ 9^m\ 30^s$ p.m., at 4737 feet. Clouds have a very fine purple tinge over a very beautiful even surface.

At $2^h\ 27^m\ 30^s$ p.m., at 4840 feet. Clouds very high above us.

At $2^h\ 45^m$ p.m., at 3274 feet. Clouds on our level.

At $3^h\ 1^m\ 30^s$ p.m., at 1075 feet. Upper clouds moving as before.

At $3^h\ 38^m\ 30^s$ p.m., at 2659 feet. In haze.

At $3^h\ 39^m$ p.m., at 2965 feet. In thicker haze.

At $3^h\ 40^m$ p.m., at 3149 feet. In cloud.

At $3^h\ 41^m$ p.m., at 3149 feet. Still in cloud.

At $3^h\ 43^m$ p.m., at 3190 feet. Misty.

At $3^h\ 44^m\ 30^s$ p.m., at 3440 feet. In cloud.

At $3^h\ 45^m$ p.m., at 3521 feet. In fog.

At $3^h\ 46^m$ p.m., at 3415 feet. In cloud.

At $3^h\ 49^m$ p.m., at 2650 feet. Out of cloud.

Direction of the Wind.

December 1, 1864.

On the ground the wind was from the W.N.W., light and variable.

On the ground at $1^h\ 15^m$ p.m., a pilot balloon first moved W., and afterwards N.W.

At 2^h 40^m p.m., at 1230 feet. The balloon entered a S.W. current.
At 2^h 57^m p.m., at 5038 feet. The wind was W.N.W.
At 3^h 33^m p.m., at 4541 feet. Smoke near the earth moving S., but after reaching 1000 feet, moving N.
At 3^h 56^m p.m., at 2830 feet. The wind was W.N.W. The smoke below moved S.

February 27, 1865.

On the ground before starting the wind was from the S.
At 2^h 1^m 30^s p.m., at 1543 feet. The wind was S.W.
At 2^h 7^m 30^s p.m., at 4418 feet. The wind was W.
At 2^h 25^m p.m., at 4828 feet. Entered a more southerly current, about S.W.
At 3^h 32^m 30^s p.m., at 2148 feet. Changed direction, moving W., I think.

On the Propagation of Sound.

December 1, 1864.

At 3^h 49^m p.m., at 4170 feet. Heard voices.
At 3^h 58^m p.m., at 2536 feet. Heard a clock stricke 4^h plainly.
At 4^h 6^m p.m., at 1804 feet. Heard many voices.
At 4^h 7^m p.m., at 1759 feet. Can hear cries of "come down."

February 27, 1865.

At 2^h 1^m p.m., at 877 feet. Bells sound very clearly.

General Observations.

December 1, 1864.

At 2^h 38^m 30^s p.m., at 644 feet. A gun fired; felt the shock.
At 2^h 39^m 30^s p.m., at 890 feet. Sun shining brightly.
At 2^h 42^m p.m., at 1831 feet. Report of proving guns at Woolwich; perceptible vibration; every rope vibrating; and every instrument shaking.
At 2^h 43^m p.m., at 2248 feet. Opened the valve; nearly opposite Belvedere.
At 2^h 46^m p.m., at 3570 feet. Sun warm.
At 2^h 54^m p.m., at 4630 feet. Between Erith and Belvedere.
At 2^h 59^m p.m., at 5328 feet. Nearly opposite Erith; hills and dales distinctly visible.
At 3^h 9^m p.m., at 4128 feet. Sand out.
At 3^h 15^m p.m., at 4909 feet. A little to the right, or nearly over Dartford.
At 3^h 17^m p.m., at 4951 feet. Moving towards Cobham Park.
At 3^h 33^m p.m., at 4541 feet. South of Greenhithe.
At 3^h 34^m p.m., at 4805 feet. In a line with Northfleet; we shall pass over Cobham Park.
At 3^h 46^m p.m., at 3470 feet. A chill to sense; sand thrown out.
At 3^h 52^m p.m., at 3744 feet. A sudden chill again.
At 3^h 53^m p.m., at 3744 feet. Sand thrown out.
At 3^h 59^m p.m., at 2497 feet. Sand again thrown out.

At 4^h 1^m p.m., at 2691 feet. Saw a railway train.
At 4^h 2^m p.m., at 2847 feet. A great deal of moisture on the balloon.
At 4^h 3^m p.m., at 2744 feet. Nearly south of Gravesend.
At 4^h 8^m p.m., at 1644 feet. Cobham Park.
At 4^h 9^m p.m., at 1550 feet. Moist to sense.
At 4^h 13^m p.m., at 1381 feet. Moisture almost dropping from the balloon.
At 4^h 14^m p.m., at 1280 feet. Approaching the Medway.
At 4^h 15^m p.m., at 1394 feet. Ascending to a higher current to cross the river.
At 4^h 17^m p.m., at 1532 feet. We can see Rochester Bridge and Castle.
At 4^h 33^m p.m. On the ground at Delce Farm near Rochester.

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At 2^h 16^m 30^s p.m., at 1020 feet. Cold.
At 2^h 19^m 30^s p.m., at 2310 feet. Dropped the grapnel.
At 2^h 23^m 30^s p.m., at 2699 feet. Just over the wall of the river.
At 2^h 24^m p.m., at 2641 feet. At least 150 vessels in sight.
At 2^h 26^m p.m., at 2301 feet. Our course is taking each bight of the river.
At 2^h 27^m 15^s p.m., at 2019 feet. Sand out.
At 2^h 28^m p.m., at 2215 feet. Cold to sense.
At 2^h 29^m p.m., at 2822 feet. Very cold.
At 2^h 29^m 45^s p.m., at 3128 feet. Much lighter; very cold.
At 2^h 32^m 15^s p.m., at 3580 feet. Sun brighter.
At 2^h 34^m p.m., at 3610 feet. Sun obscured in mist.
At 2^h 34^m 40^s p.m., at 3522 feet. In a very dense cloud.
At 2^h 36^m p.m., at 2133 feet. Falling quickly, revolving in two minutes.
At 2^h 38^m p.m., at 837 feet. We are about a mile north of Purfleet.
At 2^h 41^m 30^s p.m., at 1369 feet. Moving towards Sea Reach.
At 2^h 58^m 30^s p.m., at 670 feet. Sand thrown out.
At 3^h 3^m p.m., at 1116 feet. Moving direct for Sea Reach; we must come down if we do not change our direction.
At 3^h 6^m p.m., at 186 feet. Packed up all the instruments, cleared the tops of some trees, and came down within a mile of the river, near the Railway Station at Stanford-le-Hope.
At 3^h 10^m p.m. On the ground.

February 27, 1865.

At 1^h 58^m p.m. We left the earth.
At 2^h p.m., at 767 feet. Over the river.
At 2^h 1^m 30^s p.m., at 1085 feet. Sun obscured by cloud.
At 2^h 2^m 30^s p.m., at 1851 feet. Moving towards Barking Creek.
At 2^h 3^m 30^s p.m., at 3074 feet. Cold.
At 2^h 5^m p.m., at 3632 feet. Faint gleams of light.
At 2^h 5^m 30^s p.m., at 3851 feet. Over water.
At 2^h 6^m 30^s p.m., at 4040 feet. Sun shining faintly.
At 2^h 9^m 30^s p.m., at 4737 feet. Over Barking level; Tilbury line to our left, or N.
At 2^h 11^m p.m., at 4737 feet. Sensibly warmer.
At 2^h 12^m 30^s p.m., at 4875 feet. Over Dagenham Marsh.
At 2^h 24^m p.m., at 4828 feet. Lowered grapnel.
At 2^h 25^m p.m., at 4828 feet. Entered a more southerly current about S.W.
At 2^h 34^m p.m., at 4408 feet. Must come down.

At $2^h\ 36^m$ p.m., at 4517 feet. Sun again bright.
At $2^h\ 37^m$ p.m., at 4580 feet. Moving along Sea Reach.
At $2^h\ 41^m\ 30^s$ p.m., at 4600 feet. Sun hot.
At $2^h\ 42^m$ p.m., at 4538 feet. Opened valve.
At $3^h\ 5^m$ p.m., at 926 feet. Neck of balloon tied up.
At $3^h\ 29^m$ p.m., at 1375 feet. 12 miles from Chelmsford.
At $3^h\ 38^m$ p.m., at 2560 feet. Water looks like polished steel.
At $3^h\ 38^m\ 30^s$ p.m., at 2659 feet. Country brightened up by the sun.
At $3^h\ 39^m$ p.m., at 2965 feet. We have only one bag of ballast.
At $3^h\ 45^m\ 30^s$ p.m., at 3652 feet. Opened valve; only one bag of ballast left.
At $3^h\ 59^m\ 30^s$ p.m., at 70 feet. Just over some trees.
At $4^h\ 1^m$ p.m. On the ground at South Hanningfield.

Meteorological Observations made in connexion with the Balloon Ascent on

December 1, 1864.—Royal Observatory, Greenwich.

Time of observation.	Reading of Barom. reduced to 32° F.	Thermom. Dry.	Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
Noon.	30·003	46·5	43·9	40·9	·256	82	W.S.W.	0	0	Cloudless; slight haze in N. and S.
0 15 p.m.	30·004	46·7	44·0	40·9	·256	81	W.S.W.	0	0	
0 30 „	30·001	46·7	43·5	40·5	·252	80	W.S.W.	0	0	
0 45 „	30·004	47·1	44·2	40·9	·256	80	W.S.W.	0	0	
1 0 „	30·005	47·3	44·3	41·0	·257	79	S.W.	0	0	Cloudless; dense haze in the direction of Woolwich.
1 15 „	30·006	47·3	44·5	41·4	·261	81	W.S.W.	0	0	
1 30 „	30·006	47·3	44·5	41·4	·261	81	W.S.W.	0	0	
1 45 „	30·005	47·3	44·3	41·0	·257	79	W.S.W.	0	0	Cloudless. Haze is gradually clearing off, and a few light clouds are rising in the N.
2 0 „	30·002	47·3	44·3	41·0	·257	79	W.S.W.	1	0	Light cirrus in the N.
2 15 „	30·001	46·8	44·0	40·8	·255	80	W.S.W.	2	0	Light high cirrus in N. and N.N.E.
2 30 „	30·002	46·3	43·6	40·5	·252	81	W.S.W.	4	0	Light cirrus scattered about the sky.
2 45 „	30·002	46·3	43·5	40·4	·251	81	W.S.W.	4	0	
3 0 „	30·002	46·0	43·5	40·7	·254	82	S.W.	4	0	Balloon rising in E.S.E. Lost to view at $3^h\ 8^m$, apparently falling.
3 20 „	30·015	44·3	42·8	41·0	·257	89	S.W.	1	0	Light cirrus in S.W.; haze.
3 30 „	30·021	44·3	42·5	40·4	·251	96	S.W.	0	0	Cloudless, with the exception of a little cirrostratus in S.W.; slight haze.
3 45 „	30·024	44·0	42·3	……	……	……	S.W.	0	0	Cloudless, with the exception of a little cirrostratus in the horizon.
4 0 „	30·026	43·6	41·9	……	……	……	S.W.	0	0	Cloudless.
4 15 „	30·029	43·4	41·7	……	……	……	S.W.	0	0	
4 30 „	30·033	43·3	41·4	……	……	……	S.W.	0	0	

Meteorological Observations made in connexion with the Balloon Ascent on

December 30, 1864.—Royal Observatory, Greenwich.

Time of observation.	Reading of Barom. reduced to 32° F.	Thermom. Dry.	Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone	Remarks.
h m	in.	°	°	°	in.					
1 0 p.m.	29·788	38·8	36·1	32·5	·184	79	S.W.	10	0	
1 15 „	29·785	38·8	36·2	32·7	·186	80	S.W.	10	0	
1 30 „	29·784	38·7	36·0	32·4	·184	79	S.W.	10	0	
1 45 „	29·781	38·6	36·0	32·5	·184	79	S.W.	10	0	
2 0 „	24·781	38·5	35·8	32·3	·183	78	S.W.	10	0	
2 15 „	29·777	38·5	35·9	32·5	·184	79	S.W.	10	0	
2 30 „	29·775	38·4	36·1	33·0	·188	82	S.W.	10	0	
2 45 „	29·770	38·6	36·1	32·7	·186	80	S.W.	10	0	
3 0 „	29·760	38·6	36·1	32·7	·186	80	S.W.	10	0	
3 15 „	29·759	38·4	35·9	32·5	·184	80	S.W.	10	0	
3 30 „	29·757	38·2	35·9	32·9	·187	81	S.W.	10	0	
3 45 „	29·818	38·1	35·5	32·0	·181	79	S.W.	10	0	Generally overcast; clouds broken.
4 0 „	29·744	37·4	35·2	32·2	·182	82	S.W.	7	0	Very dense clouds in S.; cirrus elsewhere generally.

February 27, 1865.—Royal Observatory, Greenwich.

1 0 p.m.	30·017	48·6	43·4	37·7	·226	66	S.W.	10	0	
1 15 „	30·019	48·9	43·3	37·2	·222	65	S.S.W.	10	0	
1 30 „	30·014	49·0	42·9	36·2	·214	62	S.	10	0	Light cirrocumulus and a little stratus in S.W. horizon. Haze in N.
1 45 „	30·008	48·7	43·0	36·8	·218	63	S.W.	10	0	Cirrus, and cirrocumulus in the zenith. Dense cirrostratus and cumulostratus in horizon, gradually spreading over the sky.
2 0 „	29·997	47·4	42·2	36·4	·215	66	S. by W.	10	0	Cirrus; clear sky in the zenith; cumulus and cumulostratus.
2 15 „	29·995	47·9	43·1	37·8	·227	69	S.S.W.	10	0	Dense clouds almost entirely cover the sky. Balloon first seen at 2^s; and was visible for about 4^m; seen due E., and appeared moving in a northerly direction.
2 30 „	29·991	47·4	42·2	36·4	·215	66	S.W.	10	0	Sky generally covered with dense clouds, excepting a little clear in the zenith.
2 45 „	28·988	47·1	42·4	37·1	·221	68	S.S.W.	10	0	„ „ „
3 0 „	29·980	46·8	42·4	37·5	·225	70	S.W. by S.	10	0	„ „ „
3 15 „	29·975	46·3	42·1	37·2	·222	72	S.W. by S.	10	0	Generally overcast; clouds broken slightly in the air.
3 30 „	29·967	46·1	42·0	37·3	·223	72	S.S.W.	10	0	Clear sky and light cirrus in the zenith; dense clouds in the N.
3 45 „	29·965	45·9	42·0	37·5	·225	73	S.W.	10	0	Generally overcast, with the exception of a little clear in the S.E.
4 0 „	29·968	45·6	41·6	37·0	·220	73	S.W. by W.	10	0	Uniformly covered with cirrostratus.

[*From the* Report *of the* British Association *for the* Advancement *of* Science *for* 1866.]

AN ACCOUNT

OF

METEOROLOGICAL AND PHYSICAL OBSERVATIONS

IN

THREE BALLOON ASCENTS,

MADE IN

THE YEARS 1865 AND 1866

(IN CONTINUATION OF TWENTY-FIVE MADE IN THE YEARS 1862, 1863, AND 1864),

UNDER THE AUSPICES OF THE COMMITTEE

OF THE

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

BY

JAMES GLAISHER, F.R.S.

At the first appointment of the Balloon Committee it was charged with the determination of the law of the decrease of temperature with increase of elevation, as the primary object of research; and some two years since this law seemed to have been pretty well determined, but up to that time the experiments had been, for the most part, made in the months of summer and during the hours of afternoon. The principal duty of the Committee was the verification of the results then found, by including experiments at other times of the day, and at other seasons of the year. It was expected that this part of the work to be done by the balloon would have been completed. In carrying out these experiments, it was found that those taken in the morning hours did not accord with those taken in the afternoon hours, nor did those taken at one time of the year agree with those taken at other times of the year. In the course of these experiments an accidental descent just at

the time of sunset showed very little or no difference of temperature for a height of nearly half a mile. The question then arose as to whether it was possible that at night the temperature might increase with elevation, and not decrease as always heretofore had been considered, and acted upon whenever such entered into physical investigation.

The Committee last year therefore was reappointed with special reference to night observations at any time of the year made within a moderate distance of the earth. To make day observations, in winter and the adjacent months at any hour in the day; in summer to be made in the morning, only the subject of temperature to be considered as of the first importance, with any other of the usual experiments which might be possible. Up to the Meeting at Birmingham twenty-five ascents had been made, of which seventeen had been made in the months of June, July, August, and September, but not one in May, and mostly during the hours of afternoon.

§ 1. Instruments and Apparatus.

The instruments were of the same construction as those used in the previous experiments; in addition well-made miners' lamps were used to illuminate the instruments at night.

§ 2. Observing Arrangements.

The instruments were in all cases placed on suitable framework, attached to the outside of the car, and sufficiently protected from all effects of radiation.

Circumstances of the Ascents, and General Observations.

Ascent from Woolwich Arsenal, October 2, 1865.—The first ascent after the Meeting at Birmingham was made on October 2nd. The balloon used was that of Mr. Orton, of Blackwall.

When the sun had set for nearly three-quarters of an hour and night had fairly set in, the moon shining brightly, and the sky free from cloud, the balloon left Woolwich Arsenal at 6^h 20^m, the temperature at the time being 56°. Within three or four minutes a height of 900 feet was reached, and till this time I failed in directing the light of the Davy lamp properly. When I succeeded the temperature was 57° and increasing; on reaching 1200 feet high it had increased to 58°·9; we then descended to 900 feet, and the temperature decreased to 57°·8; on turning to ascend again the temperature increased to 59°·6 at 1900 feet high, being 3½° warmer than when the earth was left. On descending again the temperature decreased to 57½° at the height of 600 feet, and in the several subsequent ascensions and descensions the temperature increased with elevation, and decreased on approaching the earth. On every occasion the highest temperature was met with at the highest point. This result was remarkable indeed. The different degrees of the humidity of the air met with in this ascent are no less remarkable. Considering saturated air as represented by 100, at the commencement of the ascent in the balloon it was 95; at Greenwich Observatory it was 84; towards the end of the ascent in the balloon it was 85, and at Greenwich was 97. The state of things was reversed, and would indicate that the water in the air had fallen. Its amount at the beginning of the ascent was 5¼ grains in a cubic foot of air, and at the same elevation was 4½ grains in the same mass of air at the end of the ascent.

The readings of the instruments were taken very slowly, owing to the difficulty experienced in directing the light properly. I failed in all magnetic experiments, and indeed in nearly all but those relating to temperature and humidity. Two self-registering minimum thermometers were tied down, one with its bulb resting on cotton-wool, fully exposed to the sky, and the other with its bulb projecting beyond the supporting frame: their indexes were at the end of their columns of spirit on starting, or at 56°. At every examination of each of these instruments a space was found between its index (which remained unmoved) and the end of the column of spirit, indicating a temperature higher than before leaving, and it was closely approximate at all times to the temperature of the air. Consequently, notwithstanding the clearness of the sky, the loss of heat by radiation must have been small. No ozone was shown at the Royal Observatory, but in the balloon paper tests were coloured to 4, on a scale of greatest intensity being considered 10.

At the early part of this ascent I was wholly occupied with the instruments, and when at the height of about 1000 feet, the view which suddenly opened far exceeds description. Almost immediately under, but a little to the south-east, was Woolwich; north was Blackwall; south, Greenwich and Deptford; and west, as far as the eye could reach, was London—the whole forming a starry spectacle of such brilliancy as far to exceed anything I ever saw. When I have been at this elevation in the evening, at a distance from London, it has had the appearance of a vast conflagration, but on this night the air was so clear and free from haze that each and every light was distinct, and apparently all but touching each other.

The whole of Woolwich, Blackwall, Deptford, and Greenwich could be traced as a perfect model by the line of lights of their streets and squares. In nine minutes we were opposite Brunswick Pier, Blackwall, crossing the Thames, then passed across the Isle of Dogs, Greenwich Reach, and so up the River Thames. As we advanced towards London, the mass of illumination increased in intensity. At 6^h 42^m the South-Eastern Railway Terminus at London Bridge was directly under us; looking southward at this time we saw the Borough stretching far away, and the many streets shooting from it, particularly Southwark Street, with its graceful curve of lamps. In one minute more we were over Southwark Bridge, 1300 feet high, passed Blackfriars Bridge at 6^h 45^m, and Charing Cross at 6^h 47^m.

On leaving Charing Cross I looked back over London, the model of which could be seen and traced—its squares by their lights, the river, which looked dark and dull, by the double row of curved lights on every bridge spanning it. Looking round, two of the illuminated dials of Westminster clock were like two dull moons. Again, looking eastward, the whole lines of Commercial and Whitechapel Roads, with their continuations through Holborn to Oxford Street, were visible, and most brilliant and remarkable. We were at such a distance from Commercial Road that it appeared like a line of brilliant fire, assuming a more imposing appearance when the line separated into two, and most imposing just under in Oxford Street. Here the two thickly studded rows of brilliant lights were seen on either side of the street, with a narrow dark space between, but which dark space was bounded, as it were, on both sides by a bright fringe like frosted silver. At first I could not account for this appearance; but presently, at one point more brilliant than the rest, persons were seen passing, their shadows being thrown on the pavement, and at once it was evident this rich effect was caused by the bright illumination of the shop lights on the pavements.

I feel it impossible to convey any adequate idea of the brilliant effect of London, viewed at an elevation of 1300 feet, on a clear night, when the air is free from mist.

It seemed to me to realize a wish I have felt when looking through a telescope at portions of the Milky Way, when the field of view appeared covered with gold-dust, to be possessed of the power to see those minute spots of light as brilliant stars, for certainly the intense brilliancy of London this night must have rivalled such a view.

We were over the Marble Arch at $6^h\ 51^m$, about eleven miles in a straight line from Woolwich, which distance had been passed in about half an hour. We therefore were travelling at more than twenty miles per hour. On passing onwards we left the Edgeware Road on our right, and the Great Western Railway on our left, and passed nearly down the Harrow Road. In six or seven minutes we left the suburbs of London, passing over Middlesex in the direction of Uxbridge; there the contrast was great indeed; not a single object could anywhere be seen, not a sound reached the ear; the roar of London was entirely lost. The moon was shining, but seemed to give no light; and the earth could not be seen. After a time the moon seemed to shine with increased brightness; the fields gradually came into view, then the shadow of the balloon on the earth was seen distinctly pointing out our path, which, by reference to the pole-star and the moon, became well known. After this occasional masses of lights appeared as we passed over towns and villages. Thus we passed out of Middlesex, over parts of Buckinghamshire and Berkshire, to Highmoor, in Oxfordshire, where we descended on the farm of Mr. Reeves at $8^h\ 20^m$, distant about 45 miles from Woolwich. The horizontal movement of the air at Greenwich in the same time was registered as 16 miles.

Unfortunately, Mr. Orton believed we were near the sea, and, notwithstanding my assertions and assurances to the contrary, he suddenly brought the balloon to the ground, and broke nearly all the instruments; the lamp was lost, but an offered reward brought it to me a fortnight afterwards in a very battered condition.

The results of this first night experiment are very valuable; and, so far as one experiment can give, indicate that, on a clear night, the temperature, up to a certain elevation, increases with increase of elevation.

Ascent from Woolwich Arsenal, December 2, 1865.—The weather during the month of November was too boisterous to attempt an ascent at night, and no opportunity presented itself till December 2. This day was cloudless, and held out the prospect of a clear sky at night.

The balloon was filled, and it was ready before sunset; for some time after this it continued clear, but suddenly became overcast, obscuring the moon. When the sun had set nearly 2½ hours, we left Woolwich, Mr. Orton taking charge of the balloon. The temperature of the air just before leaving was 38¼°, at 1400 feet high it decreased 2°: unlike the previous ascent, the lowest temperature was always at the highest point, and the highest was at the lowest point of every ascent and descent, of which there were several instances at the highest point reached; when nearly one mile high the temperature was 27°, being 11° colder than when we left the earth, one hour and a half before; we then descended with the view of ascending again still higher, when unfortunately, at the height of 2400 feet, the lamp was thrown down by a jerk of the balloon, and went out; just before this the temperature was 32½°. On losing the light we continued the descent to the earth.

Pilot balloons started shortly before leaving, having indicated the lower current of air as S.E., and the upper nearly W. On leaving Woolwich we passed over Stratford, Tottenham, St. Albans, towards Tring; when here we considered ourselves high enough to venture out of the lower current, and on doing so, at the height of 3000 feet, we changed our direction, and moved with some W. in the wind; on descending again to the same level we fell in with the S.E. current.

During the whole ascent the sky was covered with cloud, and we neither saw the moon, nor could distinguish her place in the heavens, and we had to depend on the compass entirely for a knowledge of the course we were taking. This we could readily do; for although the sky was uniformly covered with cloud, with very many detached clouds below us, some of which were very near the earth, yet when no cloud was directly under us, the boundary of every field was clearly visible, even at the height of one mile. By carefully noting the angle and direction our course made with edges of the field, we determined the direction we were moving. Thus guided we kept in the lower current till we passed so far inland as to be safe from the sea, towards which the upper current would have taken us. The results of this night's experiments differ from those taken on October 2, by showing a small decrease of temperature with increasing elevation. They were made, however, entirely under the cloud; for at our highest point the cloud was uniformly dense, and situated far above us.

In our course we passed a little north of London, but, owing to a cloud of less elevation than 1000 feet between us and London, we did not see a single light, or anything of London, forming a great contrast to the experience of the previous ascent.

Arrangements were made for ascents at night in January and February, and for several months the balloon was kindly stored at night at Woolwich for the use of the Committee; but my health failed, and for many months I was too unwell to attempt an ascent at night, and thus passed till April.

Ascent from Windsor, May 29, 1866.—I have already said that no ascents had been made in May; Mr. Westcar, of the Royal Horse Guards, then stationed at Windsor, kindly offered the use of his balloon, and arrangements were made at different times in May, but, as is usual, some fruitless attempts were made.

On the 29th of May the balloon was filled early in the afternoon and left at $6^h\ 14^m$, about an hour and three-quarters before sunset, in the hope of being able to remain in the air for as long after sunset as possible.

The temperature of the air at this time was 58°, and was 58½° at Greenwich Observatory. It at once declined to 55° at 1200 feet, and to 43° between the height of 3600 to 4600 feet, then further declining to 29½° at the height of 6200 feet, at $7^h\ 17^m$. On turning to descend, the temperature increased, but not uniformly, to 54° at $8^h\ 9^m$, at 380 feet above the sea, but very nearly touching the tops of the trees, being about 3° of less temperature when at the same height above the sea on rising. Our object was to be as near the earth as possible at the time of sunset, and having seen him set to discharge sand so quickly as to make him to rise in the west. We did not succeed. At the time of sunset we were about 600 feet high, but directly passed over a hill, and on passing the ridge, the balloon was sucked down and, it was only by a very free discharge of sand that Mr. Westcar prevented the balloon coming to the ground. We then again started upon a second ascent, to be as like the one we had just completed as we could make it. At $8^h\ 9^m$ the temperature was 54°. Again the temperature declined, but somewhat less rapidly than before. On again reaching one mile the temperature had declined to 39°, and on reaching the height of 6200 feet (the same elevation as we were three-quarters of an hour before sunset), the sun having set

nearly twenty minutes, the temperature was 35°, or about 6° warmer than when at the same elevation something more than one hour before. On turning to descend, the temperature changed very little, it being 35° to 36° for a thousand feet downwards. It increased to 37° at 4500, to 47° at 1500, and to 54° at 900 feet; but here the increase was checked, and at 600 feet the temperature was $52\frac{3}{4}$°; on ascending a little again the temperature increased, and decreased on descending, and was $50\frac{1}{4}$° on the ground at a spot 300 feet above the sea, at half-past eight o'clock. At Greenwich at this time the temperature of the air was 52°.

At the time of leaving the earth at $6^h\ 14^m$ the air at Greenwich had but three grains of moisture in a cubic foot. At Windsor, near the Thames, there were $4\frac{1}{2}$ grains; the air was damp: on ascending the air at first became drier; but at the height of one mile was saturated, and was very nearly saturated at the same height after sunset.

Thus this double ascent enables us to compare the temperatures of the same elevations, just before and just after sunset on the same day, and to estimate the amount of heat radiated from the earth at about the time of sunset.

At heights exceeding 2000 feet the direction of the wind was N. by W.; at the height of one mile the air was nearly calm; and at heights less than 2000 feet it was N. by E., and these currents were met with always at those elevations.

At all times during the ascent, whenever the sun shone upon a transparent bulb, or a dull blackened bulb thermometer, the reading was a very little in excess of the reading of a shaded bulb, and was frequently the same even when the sun's heat felt sensibly warm to ourselves.

The path of the balloon from Windsor was over Windsor Great Park; nearly over Woking at $7^h\ 43^m$; a little west of Guildford, approaching the coast, at half-past nine, we calculated that the sea must be near, and we descended at a place five miles south of Pulborough.

My attention was almost wholly occupied with the observations, Mr. Westcar's was chiefly with the management of the balloon, frequently, however, reading the several instruments, particularly those whose bulbs were exposed to the sun's rays.

The safety lamp was burning all the time, thus enabling the instruments to be read after dark.

I till recently believed that this was the first ascent for scientific purposes since that of Biot and Gay-Lussac in 1804, in which the management of the balloon was undertaken by the experimentalists themselves. But I find I am in error in this respect. My friend L'Abbé Moigno tells me that Messrs. Bixio and Barrel, in the year 1850, took the entire management of the balloon in their own hands.

On descending one hour and a half nearly after sunset, there was no one near to assist us to empty the balloon and to pack it. This we had to do ourselves, and were preparing to pass the night in the car of the balloon, when towards midnight a shepherd came to attend sheep, and we passed the night in his cottage at the distance of half a mile, leaving the balloon, &c. in the fields till the morning.

This is the last ascent of which I have to speak. I regret that I have not been able to report upon others, but it is all I have possibly been able to make in the year.

From all the experiments made it would seem that the decrease of temperature with increase of elevation is variable throughout the day, and variable

in the different seasons of the year; that at about sunset the temperature varies but very little for a height of 2000 feet; that at night with a clear sky, from the only experiment made, the temperature increases with increase of elevation; that at night with a cloudy sky there was a small increase of temperature as the height increased; that in the double ascent on May 29, the one just before sunset and the other after, it would seem that after radiation is set in the heat passes upwards till arrested, where the air is saturated with vapour, when a heat greater by 5° was experienced after sunset than at the same elevation before sunset.

Two years ago, when I exhibited the mean results of the experiments then discussed, I did so with much confidence, and thought all that then was needed was to verify the results exhibited. Now, with increased knowledge, I speak very differently, believing that many more experiments are necessary, and that they should not be confined to this country.

Certain it is, from the very remarkable results obtained from the night ascents, which might, with sufficient number of observations, have important bearing both on the theory of astronomic refraction and on the theory of heat, that nocturnal observations deserve repetition and extension.

§ 3. Description of the Table of Observations.

All the meteorological observations taken during the ascents are contained in Table I.

Column 1 contains the times at which the observations were made. Column 2 contains observations of the barometer corrected for temperature and index error. Column 3 contains the height above the level of the sea, as deduced from the barometric readings in column 2, by the formula of Bailey, checked at intervals by that of Laplace, which is as follows:—

$$Z=\log\left(\frac{h'}{h}\right)\times 60159\left(1+\frac{t+t'-64}{900}\right)\left(1+0{\cdot}002837\cos 2L\right)\left(1+\frac{z+52251}{20886900}\right),$$

where Z is the height required, and h, h', t and t' the height of the barometer, corrected for temperature, and the temperature of the air at the lower and upper stations respectively, L the latitude. The temperature of the air for the position of the balloon has been derived from the readings in column 4. Columns 5 to 7 contain the observations with wet-bulb thermometer, its depression below the readings of the dry-bulb, and the deduced dew-point.

The Astronomer Royal had observations made every ten minutes at the Royal Observatory, Greenwich, on the days of ascent, by Mr. Nash of the Magnetical and Meteorological Department.

The height of Greenwich barometer cistern above the mean sea-level is 159 feet.

Table I. a.—Meteorological Observations made in the Twenty-sixth Balloon Ascent from Woolwich Arsenal, October 2, 1865.

References to Notes.	Time.	Aneroid Barometer.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.
	h m s	in.	feet.	°	°	°	°
(1)	5 25 0 p.m.	30·00		61·2	58·4	2·8	55·9
	5 35 0 ,,	30·01	on the	59·8	56·4	3·4	53·5
	5 45 0 ,,	30·01	ground	58·8	57·0	1·8	55·4
(2)	5 55 0 ,,	30·01		57·8	55·9	1·9	54·2
	6 15 0 ,,	30·01	......	57·0			
	6 16 0 ,,	30·01	......	57·0			
	6 17 0 ,,	30·01	......	56·5			
(3)	6 20 0 ,,	......	......	56·0			
(4)	6 22 0 ,,	29·90	107	56+			
(5)	6 25 0 ,,	28·99	967	57+			
(6)	6 26 30 ,,	28·81	1,139	58·2			
	6 28 0 ,,	28·68	1,266	58·7	57·2	1·5	55·9
(7)	6 29 0 ,,	28·64	1,302	58·9	57·5	1·4	56·2
(8)	6 30 0 ,,	28·94	1,011	58·5			
(9)	6 31 0 ,,	28·94	1,011	58·2	56·5	1·7	55·0
(10)	6 32 0 ,,	......	......	58·0	56·5	1·5	55·2
(11)	6 33 0 ,,	29·24	727	57·8	57·0	0·8	56·3
(12)	6 35 0 ,,	28·99	967	57·8	57·0	0·8	56·3
(13)	6 36 0 ,,	28·69	1,255	58·2	57·2	1·0	56·3
	6 37 0 ,,	28·62	1,323	57·8	57·2	0·6	56·7
(14)	6 38 0 ,,	28·64	1,304	58·0	57·2	0·8	56·5
	6 40 0 ,,	28·62	1,322	58·0	57·3	0·7	56·6
(15)	6 41 0 ,,	28·53	1,409	58·0	57·3	0·7	56·6
(16)	6 42 0 ,,	28·56	1,380	57·8	57·2	0·6	56·7
(17)	6 43 0 ,,	28·54	1,399	58·2	57·5	0·7	56·9
(18)	6 45 0 ,,	28·56	1,380	58·2	57·5	0·7	56·9
(19)	6 46 0 ,,	28·61	1,331	58·2	57·3	0·9	54·6
(20)	6 47 0 ,,						
	6 48 30 ,,	28·64	1,302	58·2			
	6 50 0 ,,	28·69	1,254	58·0	57·4	0·6	56·9
(21)	6 51 0 ,,						
(22)	6 52 0 ,,	28·64	1,302	58·0	57·4	0·6	56·9
	6 53 0 ,,	28·64	1,302	58·0	57·5	0·5	57·0
	1.	2.	3.	4.	5.	6.	7.

(1) Fixed a flat piece of cotton-wool on end of the supporting frame, and placed on it the bulb of a delicate minimum thermometer, with its bulb fully exposed to the sky; and placed a second minimum thermometer with its bulb projecting into space, and also fully exposed to the sky. (2) In the balloon just before starting.
(3) Left the earth, and found I could not read the instruments.
(4) Can just see the temperature is more than 56°.
(5) Have just succeeded in seeing that the temperature is above 57°.
(6) Can see better. (7) Nearly opposite Victoria Docks.
(8) Off Brunswick Pier, Blackwall. (9) Over the Thames.
(10) Light of moon across the river very grand.
(11) Over the Isle of Dogs; most difficult to write.
(12) Over the River Thames again. (13) London Bridge in sight.
(14) Our course is almost directly up the river.
(15) The minimum thermometer on wool near 58°, and that in air near 58°.
(16) Over South-Eastern Railway Station, London Bridge.
(17) Over Southwark Bridge. (18) Over Blackfriars Bridge.
(19) Nearly over Hungerford Railway Station.
(20) Can see people walking along the streets. Reflexion of light very remarkable indeed. Nearly over Oxford Street. (21) Over Marble Arch.
(22) Passing between Edgeware Road and Bayswater Road.

Table I. a.—(*continued*).

References to Notes.	Time.	Aneroid Barometer.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.
	h m s	in.	feet.	°	°	°	°
(1)	6 54 0 p.m.	28·38	1,552	58·9	57·9	1·0	57·0
(2)	6 55 0 ,,	28·14	1,785	59·0	58·2	0·8	57·5
	6 56 0 ,,	27·97	1,949	59·6	58·6	1·0	57·8
(3)	6 58 0 ,,	28·45	1,488	59·0	58·1	0·9	57·3
	7 0 0 ,,	28·76	1,191	59·3	58·1	1·2	57·1
	7 2 0 ,,	28·66	1,286	58·8	57·2	1·6	55·8
(4)	7 4 0 ,,	28·84	1.115	58·7	57·6	1·1	56·5
	7 5 0 ,,	28·83	1,124	58·7	57·6	1·1	56·5
(5)	7 7 0 ,,	28·84	1,115	58·6	57·6	1·0	56·7
	7 9 0 ,,	28·84	1,115	58·6	57·4	1·2	56·3
	7 11 0 ,,	29·04	925	58·6	57·4	1·2	56·3
	7 12 0 ,,	28·99	970	58·7			
	7 15 0 ,,	29·04	925	58·2	56·8	1·4	55·5
(6)	7 16 0 ,,	29·14	835	57·2	55·8	1·4	54·5
	7 17 0 ,,	29·19	790	57·3	55·8	1·5	54·3
(7)	7 18 0 ,,	29·34	655	57·5	56·2	1·3	55·0
(8)	7 19 0 ,,	29·04	925	58·2	55·6	2·6	53·2
	7 21 0 ,,	29·09	880	58·8	56·9	1·9	55·2
	7 22 0 ,,	29·24	745	58·2	56·8	1·4	55·5
	7 24 0 ,,	29·16	817				
	7 27 0 ,,	29·16	817	58·5	56·5	2·0	54·7
	7 30 0 ,,	29·16	817	58·5	57·0	1·5	55·6
	7 32 0 ,,	29·34	637	58·0	56·7	1·3	55·5
	7 35 0 ,,	29·44	537	57·6	56·1	1·5	54·8
	7 37 0 ,,	29·24	736	58·0	56·5	1·5	55·2
	7 39 0 ,,	29·03	947	58·6			
	7 44 0 ,,	29·55	519	57·2	56·2	1·0	55·3
	7 46 0 ,,	29·44	618	57·1	55·0	2·2	52·9
(9)	7 48 0 ,,	29·39	663	58·0	55·8	2·2	54·7
(10)	7 50 0 ,,	29·16	802	58·0	55·9	2·1	54·9
	7 52 0 ,,	29·06	898	58·7			
	7 55 0 ,,	28·94	1,029	58·4	56·0	2·4	53·8
(11)	7 58 0 ,,	28·94	1,029	58·5			
	8 0 0 ,,	29·24	751	56·8	54·6	2·2	52·5
(12)	8 2 0 ,,	29·44	561	57·0			
(13)	8 4 0 ,,	29·36	637	57·2	55·5	1·7	54·0
	8 10 0 ,,	29·14	846	57·7			
(14)	8 12 0 ,,	29·36	637	56·9	54·5	2·4	52·3
	8 15 0 ,,	29·09	890	57·2	55·0	2·2	53·0
(15)	8 16 0 ,,	29·24	756	57·5	54·9	2·6	52·4
	8 18 0 ,,	29·61	403	57·3	56·0	1·3	54·8
(16)	8 20 0 ,,	......	ground.	56·0			
	1.	2.	3.	4.	5.	6.	7.

(1) Thermometer on wool 58°. (2) Thermometer with projecting bulb in space 58°.
(3) Leaving London; great contrast looking towards London and looking towards Uxbridge, the direction in which we are going nearly. (4) Misty and very dark.
(5) Misty. (6) Changed direction. Can see the shadow of the balloon on the ground.
(7) Loud cheering heard. (8) The shadow of the balloon on the ground is very dark.
(9) Instruments difficult to read. (10) Crossing the River Thames.
(11) Over a wood. (12) Can see valve of the balloon.
(13) Over water, crossing the River Thames again.
(14) Can just see α Lyræ at the boundary of the balloon.
(15) Over very wooded country.
(16) Descended on a farm at Highmoor, in Oxfordshire, nine miles from Reading and five miles from Henley-upon-Thames.

TABLE I. B.—Meteorological Observations made in the Twenty-seventh Balloon Ascent from Woolwich Arsenal, December 2, 1865.

References to Notes.	Time.	Aneroid Barometer.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.
	h m s	in.	feet.	°	°	°	°
(1)	5 0 0 p.m.	29·68	on the ground	38·8	38·0	0·8	37·0
	5 8 0 „	29·68		39·0	38·1	0·9	36·9
	5 9 0 „	29·68		39·0	38·0	1·0	36·7
	5 11 0 „	29·68		39·0	38·0	1·0	36·7
	5 14 0 „	29·68		38·5	38·0	0·5	37·4
(2)	5 15 0 „	29·68		38·3	38·0	0·3	37·6
(3)	5 16 0 „	29·38	320	36·6	36·2	0·4	35·7
(4)	5 17 0 „	28·23	1,410	36·2	36·0	0·2	35·7
	5 18 0 „	28·15	1,485	36·2	36·0	0·2	35·7
(5)	5 19 0 „	28·13	1,504	36·2	36·2	0·0	36·2
	5 20 0 „	28·13	1,504	36·2	36·0	0·2	35·7
	5 21 0 „	28·03	1,598	36·3	36·2	0·1	36·0
(6)	5 22 0 „	28·33	1,316	36·3	36·2	0·1	36·0
	5 24 0 „	28·38	1,269	36·2	35·8	0·4	35·3
(7)	5 25 0 „	28·38	1,269	36·5			
	5 26 0 „	28·28	1,363	36·6	36·5	0·1	36·4
	5 27 0 „	28·23	1,410	36·7	36·6	0·1	36·5
	5 29 0 „	27·98	1,643	36·3	36·0	0·3	36·5
	5 30 0 „	27·93	1,692	36·4	35·9	0·5	35·2
	5 31 0 „	27·98	1,642	37·2	37·0	0·2	36·7
(8)	5 32 0 „	28·00	1,625	36·6	37·0		
(9)	5 32 + „	28·08	1,548				
	5 33 0 „	28·01	1,615	36·6	36·6	0·0	36·6
	5 34 0 „	27·93	1,692	36·7	36·6	0·1	36·5
	5 35 0 „	27·93	1,692	36·6	36·6	0·0	36·6
(10)	5 36 0 „	27·68	1,930	36·3	36·2	0·1	36·0
	5 37 0 „	27·58	2,025	36·2	36·0	0·2	35·7
	5 38 0 „	27·52	2,083	36·0	35·8	0·2	35·5
	5 38 + „	27·48	2,121	36·5	36·3	0·2	36·0
	5 39 0 „	27·83	1,788	37·0	36·8	0·2	36·6
(11)	5 40 0 „	27·88	1,741	37·3	37·0	0·3	36·6
	5 41 0 „	27·93	1,692	37·6	37·2	0·4	36·7
(12)	5 44 0 „	27·93	1,692	37·5	37·2	0·3	36·8
	5 45 0 „	27·73	1,882	37·2	37·2	0·0	37·2
	5 46 0 „	27·53	2,072	35·0	35·2		
	5 47 0 „	27·28	2,323	34·2	34·0	0·2	33·7
(13)	5 47 + „	27·08	2,522	34·2	34·2	0·0	34·2
	5 48 0 „	26·98	2,601	34·0	34·0	0·0	34·0
	5 49 0 „	26·98	2,601	34·0	34·0	0·0	34·0
(14)	5 50 0 „	27·13	2,457	34·2	34·2	0·0	34·2
	1.	2.	3.	4.	5.	6.	7.

(1) Let off a pilot balloon, which took the direction of N.W.
(2) Left the earth. (3) Misty all round.
(4) Damp to sense; cannot see London.
(5) Going in the direction of W. by N.; can see Woolwich, Greenwich, &c., but not London.
(6) Going towards Stratford.
(7) Near Commercial Road; can see its long line of lights.
(8) Discharged sand, about 14 lbs. in weight, and caused us to rise about 550 feet.
(9) Both radiation thermometers near 28°. (10) A densely cloudy sky.
(11) Cloudy; nothing visible.
(12) Earth dotted with large white clouds; some of them miles in extent.
(13) Moving N.W. by compass. (14) Gas clear.

TABLE I. B (*continued*).

References to Notes.	Time.	Aneroid Barometer.	Height above sea-level.	Dry and Wet Thermometers (free). Dry.	Wet.	Diff.	Dew-point.
	h m s	in.	feet.	°	°	°	°
	5 50 30 p.m.	27·44	2,157	34·8	34·2	0·6	34·2
	5 51 0 „	27·51	2,088	35·0	34·9	0·1	34·8
	5 52 0 „	27·53	2,068	34·8	34·0	0·8	32·7
	5 53 0 „	27·53	2,068	34·8	34·6	0·2	34·3
	5 54 0 „	27·48	2,316	34·5	34·3	0·2	34·0
(1)	5 55 0 „						
	5 56 30 „	27·01	2,560	32·8	33·0		
(2)	5 58 0 „	26·98	2,589	32·7	32·6	0·1	32·4
	5 59 0 „	26·98	2,589	32·7	32·5	0·2	32·1
(3)	6 0 0 „	27·03	2,541	32·7	32·5	0·2	32·1
	6 1 0 „	27·08	2,492	33·0	33·0	0·0	33·0
	6 2 0 „	26·83	2,736	33·0	33·0	0·0	33·0
(4)	6 3 0 „	26·65	2,909	33·0	33·0	0·0	33·0
(5)	6 4 0 „	26·63	2,929	33·0	32·8	0·2	32·4
	6 5 0 „	26·61	2,949	33·1	32·9	0·2	32·5
	6 6 0 „	26·58	2,978	33·0	32·7	0·3	32·1
	6 6 30 „	26·53	3,032	33·1	32·6	0·5	31·6
	6 7 0 „	26·53	3,032	33·3	32·9	0·4	32·2
(6)	6 8 0 „	26·63	2,934	33·3			
(7)	6 8 30 „	26·38	3,179	34·0	31·7	2·3	27·7
(8)	6 9 0 „	26·33	3,228	32·4	32·0	0·4	31·2
	6 10 0 „	26·33	3,228	32·0	31·7	0·3	31·0
(9)	6 11 0 „						
(10)	6 12 0 „	26·43	3,130	32·7	32·2	0·5	31·3
	6 13 0 „	26·58	2,980	32·8	32·2	0·6	31·1
	6 14 0 „	26·61	2,950	33·3	33·0	0·3	32·5
	6 15 0 „	26·65	2,910	33·5	32·3	0·2	30·1
(11)	6 16 0 „	26·88	2,680	33·4	32·7	0·7	31·4
(12)	6 17 0 „	27·13	2,443	34·0	33·5	0·5	32·6
(13)	6 18 0 „	26·68	2,883	32·8	32·3	0·5	30·7
(14)	6 22 0 „	26·08	3,477	29·5	27·8	1·7	22·1
(15)	6 23 0 „	26·01	3,546	29·4	27·2	2·2	19·8
	6 24 0 „	25·91	3,646	29·5	27·3	2·2	20·0
	6 25 0 „	25·88	3,675	29·6	27·4	2·2	20·3
	6 26 0 „	25·88	3,675	29·6	27·5	2·1	20·7
	6 27 0 „	25·97	3,585	30·0	29·5	0·5	27·9
(16)	6 28 0 „	26·13	3,425	31·1	30·0	1·1	27·1
	6 29 0 „	26·23	3,325	31·2	30·0	1·2	26·9
(17)	6 30 0 „	26·35	3,206	31·2	30·0	1·2	26·9
	6 31 0 „	26·35	3,206	31·2	29·9	1·3	26·6
	1.	2.	3.	4.	5.	6.	7.

(1) Clouds under us look very fine; fields and their boundaries very clear; can hear clock striking; sand thrown out. (2) 45 seconds crossing a field. (3) Sand thrown out.
(4) Uniform dense cloud obscuring the moon and every star.
(5) Large detached clouds under. (6) Sky cloudy above.
(7) Detached clouds in many places over land. (8) Fine appearance.
(9) Thermometer on wool read 23°·5, that in space 20°·5.
(10) Cannot see moon; direction by compass N.W.
(11) Thermometer on wool 23°·5, that in space 20°·3. (12) Sand discharged.
(13) Near Tring; entered a different current of wind and changed direction to N.N.E., a S.S.W. wind. (14) Railway train appears like a meteor.
(15) Cold to sense. (16) Sand discharged.
(17) A town visible nearly to the N. of us; ? Dunstable.

TABLE I. B (*continued.*)

References to Notes.	Time.	Aneroid Barometer.	Height above sea-level.	Dry and Wet Thermometers (free).			
				Dry.	Wet.	Diff.	Dew-point.
	h m s	in.	feet.	°	°	°	°
(1)	6 32 0 p.m.	26·13	3,426	30·9	29·0	1·9	23·8
	6 33 0 "	25·95	3,606	29·2	28·2	1·0	24·7
(2)	6 34 0 "	25·73	3,826	27·8	26·2	1·6	19·5
	6 35 0 "	25·71	3,846	27·8	26·2	1·6	19·5
	6 36 0 "	25·55	4,003	27·5	26·2	1·3	20·7
(3)	6 38 0 "	25·43	4,126	27·2	26·5	0·7	23·4
	6 39 0 "	25·15	4,406	27·2	26·2	1·0	21·7
(4)	6 39 30 "	24·93	4,628	27·2	26·2	1·0	21·7
	6 40 0 "	25·13	4,428	27·2	26·0	1·2	20·7
(5)	6 41 0 "	25·28	4,278	27·7	27·2	0·5	25·3
	6 42 0 "	25·88	3,678	29·9	28·5	1·4	24·0
(6)	6 43 0 "	26·01	3,542	30·0	29·0	1·0	25·9
	6 44 0 "	26·08	3,478	30·5	29·6	0·9	27·1
	6 45 0 "	26·43	3,128	31·0	30·3	0·7	28·4
(7)	6 46 0 "	26·93	2,628	32·0	31·5	0·5	30·3
	6 47 0 "	27·13	2,428	32·5	32·0	0·5	31·0
(8)	6 48 0 "	27·18	2,378				
	7 10 0 "	29·30	on ground.	40·2	39·3	0·9	38·2

TABLE I. c.—Meteorological Observations made in the Twenty-eighth Balloon Ascent, from Windsor, May 29, 1866.

(9)	6 12 0 p.m.	29·88	ground.	58·0	55·0	3·0	52·3
	6 14 30 "	29·31	562	57·2	55·1	2·1	53·2
	6 15 0 "	28·56	1,247	55·2	53·1	2·1	51·1
(10)	6 16 0 "	28·46	1,340	54·7	52·5	2·2	50·3
(11)	6 17 0 "	......	......	53·5	51·0	2·5	48·5
	6 17 30 "	28·01	1,782	52·5	48·1	4·4	43·6
	6 18 0 "	27·86	1,929	52·5	47·1	5·4	41·6
(12)	6 19 0 "	27·76	2,027	52·2	46·5	5·7	40·7
(13)	6 20 0 "	27·76	2,027	52·8	47·2	5·6	41·5
	6 21 0 "	27·88	1,908	52·2	47·5	4·7	42·7
(14)	6 21 30 "	27·96	1,829	53·0	47·0	6·0	41·0
	6 21 45 "	27·96	1,829	52·7	47·0	5·7	41·2
	6 22 0 "	27·77	2,017	52·5	47·3	5·2	42·0
	6 23 0 "	27·56	2,223	50·2	45·0	5·2	39·5
	1.	2.	3.	4.	5.	6.	7.

(1) Thermometer on wool 21°, that in space 19°.
(2) Thermometer on wool 20½°, that in space 18½°. (3) Sand discharged.
(4) Beautiful appearance of detached clouds on earth.
(5) Black clouds, and very high, completely cover the sky above.
(6) Moon visible; still moving N.N.W., both by the moon and compass.
(7) Changed direction; moving S.E.
(8) Whilst supplying the wet-bulb thermometer with water I fell against the lamp, and it was extinguished; came to the ground at 7 o'clock at Ridgemouth, near Woburn, Bedfordshire.
(9) Left the earth. (10) Direction due S.
(11) Thermometer in sun reads 53°. (12) Fine view of Ascot Racecourse to S.W.
(13) The numerous hawthorn trees in blossom are like snowballs on the ground. The blackened bulb thermometer in sun reads 49°. (14) Sand discharged.

TABLE I. c (*continued*).

References to Notes.	Time.	Aneroid Barometer.	Height above sea-level.	Dry and Wet Thermometers (free).			
				Dry.	Wet.	Diff.	Dew-point.
	h m s	in.	feet.	°	°	°	°
	6 24 0 p.m.	27·31	2,469	49·2	44·8	4·4	40·0
(1)	6 27 0 "	27·06	2,715	48·0	44·0	4·0	39·6
(2)	6 31 30 "	26·81	2,961	47·5	44·0	3·5	40·1
(3)	6 32 0 "	26·81	2,961	47·2	44·0	3·2	40·4
	6 33 0 "	26·68	3,093	46·8	44·0	2·8	40·9
(4)	6 36 0 "	26·61	3,171	47·2	43·1	4·1	38·5
(5)	6 37 0 "	26·51	3,276	48·2	42·1	6·1	35·4
(6)	6 39 0 "	26·37	3,418	48·9	42·0	6·9	34·5
	6 40 0 "	26·31	3,481	47·2	41·5	5·7	35·1
	6 43 0 "	26·01	3,796	47·2	42·0	5·2	36·2
(7)	6 45 0 "	25·96	3,848	46·2	41·5	4·7	36·1
	6 46 0 "	25·91	3,900	43·6	40·0	3·6	35·8
	6 47 0 "	25·78	4,036	43·5	39·3	4·2	34·3
(8)	6 48 0 "	25·56	4,264	43·2	39·8	3·4	35·8
	6 51 0 "	25·51	4,316	43·5	40·0	3·5	35·9
	6 52 0 "	25·46	4,368	43·3	40·2	3·1	36·5
	6 53 0 "	25·38	4,447	43·2	40·1	3·1	36·4
	6 54 0 "	25·26	4,572	41·5	39·5	2·0	37·0
(9)	6 55 0 "	25·16	4,675	39·0	39·0	0·0	39·0
	6 56 0 "	25·21	4,623	39·5	39·0	0·5	38·4
(10)	6 57 0 "	25·36	4,467	40·5	38·7	1·8	35·3
	6 58 0 "	25·41	4,415	40·9	38·2	2·7	34·7
(11)	6 59 0 "	25·43	4,394	41·0	38·1	2·9	34·4
	7 0 0 "	......	......	39·2	37·5	1·7	35·3
(12)	7 1 0 "	24·91	4,934	38·0	36·5	1·5	34·5
	7 2 0 "	24·77	5,078	37·2	36·1	1·1	34·6
	7 3 0 "	24·67	5,182	37·2	35·0	2·2	32·2
	7 4 0 "	24·41	5,469	35·0	34·5	0·5	33·7
	7 6 0 "	24·40	5,480	34·5	34·0	0·5	33·2
	7 7 0 "	24·16	5,739	35·0	34·5	0·5	33·7
(13)	7 8 0 "	24·16	5,739	35·2	34·1	1·1	32·4
	1.	2.	3.	4.	5.	6.	7.

(1) Misty; course still almost due S.
(2) Can hear the voices of boys calling out in Long Walk.
(3) Wonderfully wooded country. Over Virginia Water; can see ripples on the water. Blackened bulb thermometer reads 44°, and a transparent bulb 45°·2; the sun is shining on the bulbs.
(4) Still moving S.; sun shining brightly; blackened bulb 43°·1; minimum radiation 39°·2.
(5) Can see train on the South-Western line; appearance like a caterpillar; at 6h 40m just out of mist.
(6) Sun warm to sense; misty below; blue sky above; cannot see far; plain thermometer in sun reads 45°·2; the blackened bulb 44°·5.
(7) Having supplied water to the wet-bulb, the wet-finger steamed, and steam surrounded Mr. Westcar's hand.
(8) The thermometer, with its bulb exposed to the sun, reads 41°·5; the minimum thermometer reads 37°.
(9) Mr. Westcar remarked that it had suddenly become damp to sense.
(10) The sun discerned; misty.
(11) The transparent bulb reads 36°; the minimum thermometer on stand reads 36°.
(12) Gas clear; sun behind clouds.
(13) The blackened bulb thermometer reads 33°; the transparent bulb beside it reads 32°; and the minimum on stand reads 32°.

TABLE I. c (*continued*).

References to Notes.	Time.	Aneroid Barometer.	Height above sea-level.	Dry and Wet Thermometers (free).			
				Dry.	Wet.	Diff.	Dew-point.
	h m s	in.	feet.	°	°	°	°
	7 9 0 p.m.	24·14	5,760	35·0	34·1	0·9	32·7
(1)	7 10 0 „	24·14	5,760	35·2	33·6	1·6	31·2
	7 11 0 „	24·21	5,673	35·7	33·7	2·0	30·7
(2)	7 12 0 „	24·36	5,489	36·0	33·5	2·5	29·8
(3)	7 13 0 „	......	......	......	......	......	......
	7 14 0 „	24·15	5,778	31·8	30·0	1·8	25·8
	7 15 0 „	24·06	5,832	31·0	30·0	1·0	27·3
	7 16 0 „	23·91	5,999	30·5	29·1	1·4	25·1
	7 17 0 „	23·76	6,162	29·5	28·0	1·5	23·0
	7 18 0 „	23·61	6,325	29·5	28·0	1·5	23·0
	7 19 0 „	23·66	6,271	30·0	28·3	1·7	23·0
	7 20 0 „	23·76	6,162	30·5	28·5	2·0	22·8
	7 21 0 „	23·86	6,053	31·0	28·0	3·0	19·8
	7 22 0 „	23·91	5,998	31·5	28·7	2·8	21·8
(4)	7 23 0 „	23·98	5,922	32·0	29·5	2·5	23·7
	7 24 0 „	23·88	6,031	31·8	29·2	2·6	23·0
(5)	7 25 0 „	......	......	......	......	......	......
	7 26 0 „	24·11	5,790	31·8	30·0	1·8	25·8
(6)	7 27 0 „	24·26	5,617	32·2	31·5	0·7	30·1
	7 28 0 „	24·41	5,454	33·0	31·2	1·8	27·6
	7 29 0 „	24·51	5,350	33·0	31·2	1·8	27·6
	7 30 0 „	24·66	5,197	33·2	31·0	2·2	26·7
	7 31 0 „	24·76	5,078	34·0	31·2	2·8	26·2
	7 32 0 „	24·81	5,025	34·5	31·8	2·7	27·3
(7)	7 33 0 „	24·91	4,919	34·5	32·2	2·3	28·3
	7 34 0 „	25·28	4,526	35·5	33·1	2·4	29·4
(8)	7 35 0 „	25·37	4,431	36·0	34·2	1·8	31·5
(9)	7 36 0 „	25·46	4,336	......	......	......	......
	7 37 0 „	25·58	4,209	36·2	34·7	1·5	32·3
	7 38 0 „	25·76	4,019	36·2	35·0	1·2	33·2
	7 39 0 „	25·86	3,918	37·1	35·8	1·3	34·0
	7 40 0 „	26·16	3,615	38·0	36·5	1·5	34·5
	7 41 0 „	26·31	3,463	38·9	36·7	2·2	33·8
	7 42 0 „	26·51	3,261	39·2	37·0	2·2	34·1
(10)	7 43 0 „	26·54	3,230	40·5	37·5	3·0	33·7
	7 44 0 „	27·06	2,716	41·1	37·8	3·3	33·7
	7 45 0 „	27·11	2,669	41·1	38·0	3·1	34·1
(11)	7 46 0 „	27·11	2,669	42·0	38·5	3·5	34·2
	7 47 0 „	27·38	2,407	43·5	40·0	3·5	35·8
	7 48 0 „	27·46	2,329	44·0	40·2	3·8	35·7
	7 49 0 „	27·65	2,142	44·9	40·3	4·6	34·9
	7 50 0 „	27·86	1,937	44·9	40·5	4·4	35·4
(12)	7 51 0 „	27·98	1,821	45·0	40·9	4·1	36·2
	1.	2.	3.	4.	5.	6.	7.

(1) Gas misty. (2) The minimum radiation thermometer reads 31°.
(3) Near Woking; moving very slowly. (4) Golden spangles in water.
(5) Let off parachute; fell slowly and very prettily.
(6) The minimum radiation thermometer reads 27°·7.
(7) Golden rays of sun shining on water again.
(8) The minimum radiation thermometer reads 31°.
(9) Approaching Guildford very slowly; Aldershot in distance; main line of South-Western Railway nearly under us.
(10) Over cemetery near Woking; the minimum radiation thermometer reads 25°.
(11) Let off parachute. (12) Waterfall visible to the left.

TABLE I. c (*continued*).

References to Notes.	Time.	Aneroid Barometer.	Height above sea-level.	Dry and Wet Thermometers (free).			
				Dry.	Wet.	Diff.	Dew-point.
	h m s	in.	feet.	°	°	°	°
(1)	7 52 0 p.m.	28·36	1,457	46·2	42·0	4·2	37·2
(2)	7 53 0 „	28·43	1,393	47·0	42·2	4·8	36·8
	7 54 0 „	28·46	1,365	48·0	42·5	5·5	36·4
(3)	7 59 0 „	28·51	1,318	48·0	42·5	5·5	36·4
(4)	7 59 30 „	......	......	48·2	43·2	5·0	37·7
(5)	8 0 0 „	28·81	1,031	48·2	43·2	5·0	37·7
	8 1 0 „	28·88	960	48·3	43·3	5·0	37·8
(6)	8 3 0 „	28·91	939	48·3	43·3	5·0	37·8
	8 4 0 „	29·01	842	49·0	44·5	4·5	40·6
(7)	8 5 0 „	29·06	801	49·5	44·5	5·0	39·1
(8)	8 6 0 „	29·21	663	51·2	46·0	5·2	40·6
	8 7 0 „	29·22	654	51·2	46·0	5·2	40·6
(9)	8 8 0 „	29·22	654	51·2	46·0	5·2	40·6
	8 9 0 „	29·41	479	54·0	47·8	6·2	41·7
	8 10 0 „	28·74	1,110	52·0	46·5	5·5	40·9
	8 11 0 „	28·46	1,379	51·0	46·2	4·8	41·2
	8 12 0 „	28·26	1,571	50·5	45·5	5·0	40·2
	8 13 0 „	27·88	1,958	49·1	44·1	5·0	38·7
	8 14 0 „	27·46	2,362	48·2	43·7	4·5	38·8
	8 15 0 „	27·01	2,795	47·0	43·0	4·0	38·5
	8 15 30 „	26·66	3,152	44·2	41·8	2·4	39·0
	8 16 0 „	26·28	3,540	43·5	40·8	2·7	37·6
	8 16 30 „	26·06	3,761	42·2	40·5	1·7	38·4
	8 17 0 „	25·87	3,952	41·0	40·9	0·1	40·8
	8 17 30 „	25·64	4,197	39·8	38·2	1·6	36·1
	8 17 45 „	25·45	4,388	39·1	38·0	1·1	36·6
	8 18 0 „	25·27	4,579	38·9	38·2	0·7	37·3
	8 18 15 „	25·08	4,778	38·9	38·5	0·4	38·0
	8 18 30 „	24·88	4,990	38·9	38·5	0·4	38·0
	8 18 45 „	24·74	5,143	38·9	38·5	0·4	38·0
(10)	8 19 0 „	24·56	5,339	38·9	38·5	0·4	38·0
	8 19 15 „	24·38	5,533	38·5	38·4	0·1	38·3
	8 19 30 „	24·28	5,642	38·0	38·0	0·0	38·0
	8 19 45 „	23·96	5,979	34·5	34·2	0·3	33·7
(11)	8 20 0 „	23·76	6,197	33·5	33·3	0·2	33·0
	8 20 15 „	23·66	6,317	33·6	33·4	0·2	33·2
	8 20 30 „	23·64	6,341	34·0	34·0	0·0	34·0
	8 20 45 „	23·64	6,341	34·5	34·5	0·0	34·5
	8 21 0 „	23·64	6,341	34·6	34·5	0·1	34·4
	8 21 15 „	23·61	6,377	35·0	34·9	0·1	34·8
	8 21 30 „	23·58	6,413	35·1	34·9	0·2	34·6
	8 21 45 „	23·63	6,356	35·2	35·0	0·2	34·5
(12)	8 22 15 „	23·77	6,198	35·9	35·3	0·6	34·4
	8 22 30 „	23·78	6,186	35·9	35·3	0·6	34·4
	8 22 45 „	23·91	6,039	35·9	35·3	0·6	34·4
	8 23 0 „	23·96	5,982	35·9	35·3	0·6	34·4
	8 23 15 „	24·04	5,892	35·5	35·2	0·3	34·7
	1.	2.	3.	4.	5.	6.	7.

(1) Appearance of May trees very peculiar. (2) The parachute seems to skim over the earth. (3) Parachute reached the earth. (4) Can hear the quacking of ducks. (5) The radiation thermometer reads 44°. (6) Close to the town of Guildford, which is a little west of us. (7) Passing over high land; Box Hill range. (8) Sun setting. (9) Sucked down very remarkably on going over the hill; two bags of sand required to counteract the effect. (10) Opened the valve a little; the first time since leaving Windsor. (11) Sensibly damp and cold. (12) Mist over the earth; cannot see far.

TABLE I. c (*continued*).

References to Notes.	Time.	Aneroid Barometer.	Height above sea-level.	Dry and Wet Thermometers (free).			
				Dry.	Wet.	Diff.	Dew-point.
	h m s	in.	feet.	°	°	°	°
	8 23 30 p.m.	24·64	5,892	35·0	34·2	0·8	32·9
	8 23 45 „	23·94	6,005	35·5	34·6	0·9	33·2
	8 24 0 „	23·88	6,073	36·0	34·5	1·5	32·3
	8 25 0 „	23·86	6,096	36·0	34·3	1·7	31·7
	8 26 0 „	23·86	6,096	36·2	34·2	2·0	31·2
	8 27 0 „	23·88	6,073	35·9	34·1	1·8	30·1
	8 28 0 „	23·78	6,186	35·6	33·9	1·7	31·3
	8 29 0 „	23·84	6,118	35·9	33·9	2·0	30·9
	8 30 0 „	23·88	6,073	36·0	33·8	2·2	30·5
	8 31 0 „	24·06	5,873	35·6	33·5	2·1	30·2
	8 32 0 „	24·19	5,733	35·7	33·5	2·2	30·1
	8 33 0 „	24·38	5,528	36·5	34·2	2·3	30·9
	8 34 0 „	24·51	5,388	36·8	34·3	2·5	30·8
	8 35 0 „	24·86	5,010	36·8	34·4	2·4	31·0
(1)	8 36 0 „	25·11	4,740	37·2	35·1	2·1	32·2
	8 37 0 „	25·46	4,362	37·2	35·8	1·4	33·9
	8 38 0 „	25·78	4,036	38·7	38·1	0·6	37·3
	8 39 0 „	26·01	3,801	39·0	37·1	1·9	34·6
	8 40 0 „	26·16	3,646	39·3	37·2	2·1	34·4
	8 40 30 „	26·21	3,595	40·0	37·8	2·2	34·9
	8 41 0 „	26·41	3,391	40·7	37·8	2·9	34·1
	8 41 30 „	26·44	3,361	41·0	37·9	3·1	34·0
	8 42 0 „	26·48	3,321	41·0	38·0	3·0	34·2
	8 43 0 „	26·76	3,041	43·5	40·5	3·0	37·0
	8 43 30 „	26·81	2,991	43·7	40·5	3·2	36·7
(2)	8 44 0 „	26·83	2,971	43·6	40·5	3·1	36·8
	8 45 0 „	26·98	2,823	44·0	40·7	3·3	36·8
	8 46 0 „	27·38	2,427	44·5	41·0	3·5	36·9
(3)	8 46 30 „	27·71	2,104	45·0	41·2	3·8	36·6
	8 47 0 „	28·01	1,810	46·5	42·1	4·4	37·1
	8 48 0 „	28·08	1,743	47·0	43·0	4·0	38·5
(4)	8 48 30 „	28·44	1,397	48·2			
	8 49 0 „	28 68	1,186	49·3	45·1	4·2	40·6
	8 50 0 „	28·91	967	52·5	47·8	4·7	43·0
	8 51 0 „	29·01	872	53·0	47·4	5·6	41·8
	8 52 0 „	29·08	802	53·2	47·4	5·8	41·6
(5)	8 53 0 „	29·16	722	53·7	48·2	5·5	42·8
	8 54 0 „	29·16	722	53·7	49·9	3·8	46·2
	8 55 0 „	29·16	722	53·7	49·9	3·8	46·2
	8 56 0 „	29·16	722	53·7	49·9	3·8	46·2
	8 57 0 „	29·16	722	53·7	49·9	3·8	46·2
	8 58 0 „	29·16	722	53·9	49·7	4·2	45·5
	8 59 0 „	29·16	722	54·0			
	9 0 0 „	29·16	722	54·0	49·3	4·7	44·7
	9 1 0 „	29·28	608	53·8	49·0	4·8	44·3
	9 2 0 „	29·20	684	53·5			
	9 3 0 „	29·10	779	53·7	47·5	6·2	41·3
(6)	9 4 0 „	29·01	865	54·0	46·2	7·8	58·6
(7)	9 10 0 „	29·16	722	53·8	45·0	8·8	36·4
	9 12 0 „	28·91	961	54·0	45·5	8·5	37·2
	9 13 0 „	29·16	722	53·8	45·4	8·4	37·1
	9 14 0 „	29·26	631	53·0	45·4	7·6	37·8
	9 15 0 „	29·31	585	52·7	45·3	7·4	37·9
(8)	9 25 0 „	29·55	ground.	50·2	45·0	5·2	39·5
	1.	2.	3.	4.	5.	6.	7.

(1) Moon just peeped out of cloud. (2) Can hear a train to the left. (3) Compelled to use the lamp. (4) Near Petworth. (5) Extraordinary wooded country. (6) Began to pack up, being near the sea; high land before us. (7) Sand thrown out. (8) Came to the ground at Mr. Tickner's Farm, 5 miles south of Pulborough.

§ 4. Adopted Temperatures of the Air, the Wet-bulb, and the Dew-point in Three Balloon Ascents.

TABLE II. A.—Showing the adopted Reading of the Barometer, calculated Height above the Sea, Temperature of the Air, Temperature of the Wet-bulb Thermometer, and Temperature of the Dew-point, in the

TWENTY-SIXTH ASCENT.—October 2, 1865.

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°	h m s	in.	feet.	°	°	°
5 25 0	30·00	......	61·2	58·4	55·9	7 4 0	28·84	1115	58·7	57·6	56·5
35 0	30·01	......	59·8	56·4	53·5	5 0	28·83	1124	58·7	57·6	56·5
45 0	30·01	......	58·8	57·0	55·4	7 0	28·84	1115	58·6	57·6	56·7
55 0	30·01	......	57·8	55·9	54·2	9 0	28·84	1115	58·6	57·4	56·3
6 15 0	30·01	......	57·0			11 0	29·04	925	58·6	57·4	56·3
16 0	30·01	......	57·0			12 0	28·99	970	58·7		
17 0	30·01	......	56·5			15 0	29·04	925	58·2	56·8	55·5
20 0	......	......	56·0	55·0	54·0	16 0	29·14	835	57·2	55·8	54·5
22 0	29·90	107	56+			17 0	29·19	790	57·3	55·8	54·3
25 0	28·99	967	57+			18 0	29·34	655	57·5	56·2	55·0
26 30	28·81	1139	58·2			19 0	29·04	925	58·2	55·6	53·2
28 0	28·68	1266	58·7	57·2	55·9	21 0	29·09	880	58·8	56·9	55·2
29 0	28·64	1302	58·9	57·5	56·2	22 0	29·24	745	58·2	56·8	55·5
30 0	28·94	1011	58·5			24 0	29·16	817			
31 0	28·94	1011	58·2	56·5	55·0	27 0	29·16	817	58·5	56·5	54·7
32 0	......	......	58·0	56·5	55·2	30 0	29·16	817	58·5	57·0	55·6
33 0	29·24	727	57·8	57·0	56·3	32 0	29·34	637	58·0	56·7	55·5
35 0	28·99	967	57·8	57·0	56·3	35 0	29·44	537	57·6	56·1	54·8
36 0	28·69	1255	58·2	57·2	56·3	37 0	29·24	737	58·0	56·5	55·2
37 0	28·62	1323	57·8	57·2	56·7	39 0	29·03	947	58·6		
38 0	28·64	1304	58·0	57·2	56·5	44 0	29·55	519	57·2	56·2	55·3
40 0	28·62	1322	58·0	57·3	56·6	46 0	29·44	618	57·2	55·0	52·9
41 0	28·53	1409	58·0	57·3	56·6	48 0	29·39	663	58·0	55·8	54·7
42 0	28·56	1380	57·8	57·2	56·7	50 0	29·16	802	58·0	55·9	54·9
43 0	28·54	1399	58·2	57·5	56·9	52 0	29·06	898	58·7		
45 0	28·56	1380	58·2	57·5	56·9	55 0	28·94	1029	58·4	56·0	53·8
46 0	28·61	1331	58·2	57·3	54·6	58 0	28·94	1029	58·5		
48 30	28·64	1302	58·2			8 0 0	29·24	751	56·8	54·6	52·5
50 0	28·69	1254	58·0	57·4	56·9	2 0	29·44	561	57·0		
52 0	28·64	1302	58·0	57·4	56·9	4 0	29·36	637	57·2	55·5	54·0
53 0	28·64	1302	58·0	57·5	57·0	10 0	29·14	846	57·7		
54 0	28·38	1552	58·9	57·9	57·0	12 0	29·36	637	56·9	54·5	52·3
55 0	28·14	1785	59·0	58·2	57·5	15 0	29·09	890	57·2	55·0	53·0
56 0	27·97	1949	59·6	58·6	57·8	16 0	29·24	756	57·5	54·9	52·4
58 0	28·45	1488	59·0	58·1	57·3	18 0	29·61	403	57·3	56·0	54·8
7 0 0	28·76	1191	59·3	58·1	57·1	20 0	......	ground.	56·0	55·6	55·2
2 0	28·66	1286	58·8	57·2	55·8						

Twenty-seventh Ascent.—December 2, 1865.

Time of observation. P.M. (h m s)	Reading of the Barom. reduced to 32° F. (in.)	Height above the level of the sea. (feet.)	Temp. of the Air. (°)	Temp. of the Wet-bulb. (°)	Temp. of the Dew-point. (°)
5 0 0	29·68	on the ground	38·8	38·0	37·0
8 0	29·68		39·0	38·1	36·9
9 0	29·68		39·0	38·0	36·7
11 0	29·68		39·0	38·0	36·7
14 0	29·68		38·5	38·0	37·4
15 0	29·68		38·3	38·0	37·6
16 0	29·38	320	36·6	36·2	35·7
17 0	28·23	1410	36·2	36·0	35·7
18 0	28·15	1485	36·2	36·0	35·7
19 0	28·13	1504	36·2	36·2	36·2
20 0	28·13	1504	36·2	36·0	35·7
21 0	28·03	1598	36·3	36·2	36·0
22 0	28·33	1316	36·3	36·2	36·0
24 0	28·38	1269	36·2	35·8	35·3
25 0	28·38	1269	36·5		
26 0	28·28	1363	36·6	36·5	36·4
27 0	28·23	1410	36·7	36·6	36·5
29 0	27·98	1643	36·3	36·0	36·5
30 0	27·93	1692	36·4	35·9	35·2
31 0	27·98	1642	37·2	37·0	36·7
32 0	28·00	1625	36·6	37·0	
32 +	28·08	1548			
33 0	28·01	1615	36·6	36·6	36·6
34 0	27·93	1692	36·7	36·6	36·5
35 0	27·93	1692	36·6	36·6	36·6
36 0	27·68	1930	36·3	36·2	36·0
37 0	27·58	2025	36·2	36·0	35·7
38 0	27·52	2083	36·0	35·8	35·5
38 +	27·48	2121	36·5	36·3	36·0
39 0	27·83	1788	37·0	36·8	36·6
40 0	27·88	1741	37·3	37·0	36·6
41 0	27·93	1692	37·6	37·2	36·7
44 0	27·93	1692	37·5	37·2	36·8
45 0	27·73	1882	37·2	37·2	37·2
46 0	27·53	2072	35·0	35·2	
47 0	27·28	2323	34·2	34·0	33·7
47 +	27·08	2522	34·2	34·2	34·2
48 0	26·98	2601	34·0	34·0	34·0
49 0	26·98	2601	34·0	34·0	34·0
50 0	27·13	2457	34·2	34·2	34·2
50 30	27·44	2157	34·8	34·2	34·2
51 0	27·51	2088	35·0	34·9	34·8
52 0	27·53	2068	34·8	34·0	32·7
53 0	27·53	2068	34·8	34·6	34·3
54 0	27·48	2316	34·5	34·3	34·0
56 30	27·01	2560	32·8	33·0	
58 0	26·98	2589	32·7	32·6	32·4

Time of observation. P.M. (h m s)	Reading of the Barom. reduced to 32° F. (in.)	Height above the level of the sea. (feet.)	Temp. of the Air. (°)	Temp. of the Wet-bulb. (°)	Temp. of the Dew-point. (°)
5 59 0	26·98	2589	32·7	32·5	32·1
6 0 0	27·03	2541	32·7	32·5	32·1
1 0	27·08	2492	33·0	33·0	33·0
2 0	26·83	2736	33·0	33·0	33·0
3 0	26·65	2909	33·0	33·0	33·0
4 0	26·63	2929	33·0	32·8	32·4
5 0	26·61	2949	33·1	32·9	32·5
6 0	26·58	2978	33·0	32·7	32·1
6 30	26·53	3032	33·1	32·6	31·6
7 0	26·53	3032	33·3	32·9	32·2
8 0	26·63	2934	33·3		
8 30	26·38	3179	34·0	31·7	27·7
9 0	26·33	3228	32·4	32·0	31·2
10 0	26·33	3228	32·0	31·7	31·0
12 0	26·43	3129	32·7	32·2	31·3
13 0	26·58	2980	32·8	32·2	31·1
14 0	26·61	2950	33·3	33·0	32·5
15 0	26·65	2910	33·5	32·3	30·1
16 0	26·88	2680	33·4	32·7	31·4
17 0	27·13	2443	34·0	33·5	32·6
18 0	26·68	2883	32·8	32·3	30·7
22 0	26·08	3477	29·5	27·8	22·1
23 0	26·01	3546	29·4	27·2	19·8
24 0	25·91	3646	29·5	27·3	20·0
25 0	25·88	3675	29·6	27·4	20·3
26 0	25·88	3675	29·6	27·5	20·7
27 0	25·97	3585	30·0	29·5	27·9
28 0	26·13	3425	31·1	30·0	27·1
29 0	26·23	3325	31·2	30·0	26·9
30 0	26·35	3206	31·2	30·0	26·9
31 0	26·35	3206	31·2	29·9	26·6
32 0	26·13	3426	30·9	29·0	23·8
33 0	25·95	3606	29·2	28·2	24·7
34 0	25·73	3826	27·8	26·2	19·5
35 0	25·71	3846	27·8	26·2	19·5
36 0	25·55	4003	27·5	26·2	20·7
38 0	25·43	4126	27·2	26·5	23·4
39 0	25·15	4406	27·2	26·2	21·7
39 30	24·93	4628	27·2	26·2	21·7
40 0	25·13	4428	27·2	26·0	20·7
41 0	25·28	4278	27·7	27·2	25·3
42 0	25·88	3678	29·9	28·5	24·0
43 0	26·01	3542	30·0	29·0	25·9
44 0	26·08	3478	30·5	29·6	27·1
45 0	26·43	3128	31·0	30·3	28·4
46 0	26·93	2628	32·0	31·5	30·3
47 0	27·13	2428	32·5	32·0	31·0

Twenty-eighth Ascent.—May 29, 1866.

Time of observation. P.M. (h m s)	Reading of the Barom. reduced to 32° F. (in.)	Height above the level of the sea. (feet.)	Temp. of the Air. (°)	Temp. of the Wet-bulb. (°)	Temp. of the Dew-point. (°)
6 12 0	29·88	ground	58·0	55·0	52·3
14 30	29·31	562	57·2	55·1	53·2
15 0	28·56	1247	55·2	53·1	51·1
16 0	28·46	1340	54·7	52·5	50·3
17 0	......	......	53·5	51·0	48·5
17 30	28·01	1782	52·5	48·1	43·6
18 0	27·86	1929	52·5	47·1	41·6
19 0	27·76	2027	52·2	46·5	40·7
20 0	27·76	2027	52·8	47·2	41·5
21 0	27·88	1908	52·2	47·5	42·7
21 30	27·96	1829	53·0	47·0	41·0
21 45	27·96	1829	52·7	47·0	41·2
22 0	27·77	2017	52·5	47·3	42·0
23 0	27·56	2223	50·2	45·0	39·5
24 0	27·31	2469	49·2	44·8	40·0
27 0	27·06	2715	48·0	44·0	39·6
31 30	26·81	2961	47·5	44·0	40·1
32 0	26·81	2961	47·2	44·0	40·4
33 0	26·68	3093	46·8	44·0	40·9
36 0	26·61	3171	47·2	43·1	38·5
37 0	26·51	3276	48·2	42·1	35·4
39 0	26·37	3418	48·9	42·0	34·5
40 0	26·31	3481	47·2	41·5	35·1
43 0	26·01	3796	47·2	42·0	36·2
45 0	25·96	3848	46·2	41·5	36·1
46 0	25·91	3900	43·6	40·0	35·8
47 0	25·78	4036	43·5	39·3	34·3
48 0	25·56	4264	43·2	39·8	35·8
51 0	25·51	4316	43·5	40·0	35·9
52 0	25·46	4368	43·3	40·2	36·5
53 0	25·38	4447	43·2	40·1	36·4
54 0	25·26	4572	41·5	39·5	37·0
55 0	25·16	4675	39·0	39·0	39·0
56 0	25·21	4623	39·5	39·0	38·4
57 0	25·36	4467	40·5	38·7	35·3
58 0	25·41	4415	40·9	38·2	34·7
59 0	25·43	4394	41·0	38·1	34·4
7 0 0	......	......	39·2	37·5	35·3
1 0	24·91	4934	38·0	36·5	34·5
2 0	24·77	5078	37·2	36·1	34·6
3 0	24·67	5182	37·2	35·0	32·2
4 0	24·41	5469	35·0	34·5	33·7
6 0	24·40	5480	34·5	34·0	33·2
7 0	24·16	5739	35·0	34·5	33·7
8 0	24·16	5739	35·2	34·1	32·4
9 0	24·14	5760	35·0	34·1	32·7
10 0	24·14	5760	35·2	33·6	31·2
11 0	24·21	5673	35·7	33·7	30·7
12 0	24·36	5489	36·0	33·5	29·8
14 0	24·11	5778	31·8	30·0	25·8
15 0	24·06	5832	31·0	30·0	27·3
16 0	23·91	5999	30·5	29·1	25·1
17 0	23·76	6162	29·5	28·0	23·0
18 0	23·61	6325	29·5	28·0	23·0
19 0	23·66	6271	30·0	28·3	23·0

Time of observation. P.M. (h m s)	Reading of the Barom. reduced to 32° F. (in.)	Height above the level of the sea. (feet.)	Temp. of the Air. (°)	Temp. of the Wet-bulb. (°)	Temp. of the Dew-point. (°)
7 20 0	23·76	6162	30·5	28·5	22·8
21 0	23·86	6053	31·0	28·0	19·8
22 0	23·91	5998	31·5	28·7	21·8
23 0	23·98	5922	32·0	29·5	23·7
24 0	23·88	6031	31·8	29·2	23·0
26 0	24·11	5790	31·8	30·0	25·8
27 0	24·26	5617	32·2	31·5	30·1
28 0	24·41	5454	33·0	31·2	27·6
29 0	24·51	5350	33·0	31·2	27·6
30 0	24·66	5197	33·2	31·0	26·7
31 0	24·76	5078	34·0	31·2	26·2
32 0	24·81	5025	34·5	31·8	27·3
33 0	24·91	4919	34·5	32·2	28·3
34 0	25·28	4526	35·5	33·1	29·4
35 0	25·37	4431	36·0	34·2	31·5
37 0	25·58	4209	36·2	34·7	32·3
38 0	25·76	4019	36·2	35·0	33·2
39 0	25·86	3918	37·1	35·8	34·0
40 0	26·16	3615	38·0	36·5	34·5
41 0	26·31	3463	38·9	36·7	33·8
42 0	26·51	3261	39·2	37·0	34·1
43 0	26·54	3230	40·5	37·5	33·7
44 0	27·06	2716	41·1	37·8	33·7
45 0	27·11	2669	41·1	38·0	34·1
46 0	27·11	2669	42·0	38·5	34·2
47 0	27·38	2407	43·5	40·0	35·8
48 0	27·46	2329	44·0	40·2	35·7
49 0	27·65	2742	44·9	40·3	34·9
50 0	27·86	1937	44·9	40·5	35·4
51 0	27·98	1821	45·0	40·9	36·2
52 0	28·36	1457	46·2	42·0	37·2
53 0	28·43	1393	47·0	42·2	36·8
54 0	28·46	1365	48·0	42·5	36·4
59 0	28·51	1318	48·0	42·5	36·4
59 30	......	......	48·2	43·2	37·7
8 0 0	28·81	1031	48·2	43·2	37·7
1 0	28·88	960	48·3	43·3	37·8
3 0	28·91	939	48·3	43·3	37·8
4 0	29·01	847	49·0	44·5	40·6
5 0	29·06	801	49·5	44·5	39·1
6 0	29·21	663	51·2	46·0	40·6
7 0	29·22	654	51·2	46·0	40·6
8 0	29·22	654	51·2	46·0	40·6
9 0	29·41	479	54·0	47·8	41·7
10 0	28·74	1110	52·0	46·5	40·9
11 0	28·46	1379	51·0	46·2	41·2
12 0	28·26	1571	50·5	45·5	40·2
13 0	27·88	1958	49·1	44·1	38·7
14 0	27·46	2362	48·2	43·7	38·8
15 0	27·01	2795	47·0	43·0	38·5
15 30	26·66	3152	44·2	41·8	39·0
16 0	26·28	3540	43·5	40·8	37·6
16 30	26·06	3761	42·2	40·5	38·4
17 0	25·87	3952	41·0	40·9	40·8
17 30	25·64	4197	39·8	38·2	36·1
17 45	25·45	4388	39·1	38·0	36·6
18 0	25·27	4579	38·9	38·2	37·3

TWENTY-EIGHTH ASCENT.—May 29, 1866 (*continued*).

Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.	Time of observation. P.M.	Reading of the Barom. reduced to 32° F.	Height above the level of the sea.	Temp. of the Air.	Temp. of the Wet-bulb.	Temp. of the Dew-point.
h m s	in.	feet.	°	°	°	h m s	in.	feet.	°	°	°
8 18 15	25·08	4778	38·9	38·5	38·0	8 39 0	26·01	3801	39·0	37·1	34·6
18 30	24·88	4990	38·9	38·5	38·0	40 0	26·16	3646	39·3	37·2	34·4
18 45	24·74	5143	38·9	38·5	38·0	40 30	26·21	3595	40·0	37·8	34·9
19 0	24·56	5339	38·9	38·5	38·0	41 0	26·41	3391	40·7	37·8	34·1
19 15	24·38	5533	38·5	38·4	38·3	41 30	26·44	3361	41·0	37·9	34·0
19 30	24·28	5642	38·0	38·3	38·0	42 0	26·48	3321	41·0	38·0	34·2
19 45	23·96	5979	34·5	34·2	33·7	43 0	26·76	3041	43·5	40·5	37·0
20 0	23·76	6197	33·5	33·3	33·0	43 30	26·81	2991	43·7	40·5	36·7
20 15	23·66	6317	33·6	33·4	33·2	44 0	26·83	2971	43·6	40·5	36·8
20 30	23·64	6341	34·0	34·0	34·0	45 0	26·98	2823	44·0	40·7	36·8
20 45	23·64	6341	34·5	34·5	34·5	46 0	27·38	2427	44·5	41·0	36·9
21 0	23·64	6341	34·6	34·5	34·4	46 30	27·71	2104	45·0	41·2	36·6
21 15	23·61	6377	35·0	34·9	34·8	47 0	28·01	1810	46·5	42·1	37·1
21 30	23·58	6413	35·1	34·9	34·6	48 0	28·08	1743	47·0	43·0	38·5
21 45	23·63	6356	35·2	35·0	34·5	48 30	28·44	1397	48·2		
22 15	23·77	6198	35·9	35·3	34·4	49 0	28·68	1186	49·3	45·1	40·6
22 30	23·78	6186	35·9	35·3	34·4	50 0	28·91	967	52·5	47·8	43·0
22 45	23·91	6039	35·9	35·3	34·4	51 0	29·01	872	53·0	47·4	41·8
23 0	23·96	5982	35·9	35·3	34·4	52 0	29·08	802	53·2	47·4	41·6
23 15	24·04	5892	35·5	35·2	34·7	53 0	29·16	722	53·7	48·2	42·8
23 30	24·04	5892	35·0	34·2	32·9	54 0	29·16	722	53·7	49·9	46·2
23 45	23·94	6005	35·5	34·6	33·2	55 0	29·16	722	53·7	49·9	46·2
24 0	23·88	6073	36·0	34·5	32·3	56 0	29·16	722	53·7	49·9	46·2
25 0	23·86	6096	36·0	34·3	31·7	57 0	29·16	722	53·7	49·9	46·2
26 0	23·86	6096	36·2	34·2	31·2	58 0	29·16	722	53·9	49·7	45·5
27 0	23·88	6073	35·9	34·1	30·1	59 0	29·16	722	54·0		
28 0	23·78	6186	35·6	33·9	31·3	9 0 0	29·16	722	54·0	49·3	44·7
29 0	23·84	6118	35·9	33·9	30·9	1 0	29·28	608	53·8	49·0	44·3
30 0	23·88	6073	36·0	33·8	30·5	2 0	29·20	684	53·5		
31 0	24·06	5873	35·6	33·5	30·2	3 0	29·10	779	53·7	47·5	41·3
32 0	24·19	5733	35·7	33·5	30·1	4 0	29·01	865	54·0	46·2	58·6
33 0	24·38	5528	36·5	34·2	30·9	10 0	29·16	722	53·8	45·0	36·4
34 0	24·51	5388	36·8	34·3	30·8	12 0	28·91	961	54·0	45·5	37·2
35 0	24·86	5010	36·8	34·4	31·0	13 0	29·16	724	53·8	45·4	37·1
36 0	25·11	4740	37·2	35·1	32·2	14 0	29·26	631	53·0	45·4	37·8
37 0	25·46	4362	37·2	35·8	33·9	15 0	29·31	585	52·7	45·3	37·9
38 0	25·78	4036	38·7	38·1	37·3	25 0	29·55	ground	50·2	45·0	39·5

The readings of temperature in the preceding Tables were formed in small groups, including observations which had been taken in quick succession, or at about the same distance from the earth, or when the balloon had passed upwards and downwards through the same space within a few minutes; as, for example, on May 29, between $6^h\ 17^m$ and $6^h\ 22^m$

h m s	Height. feet.	Temperature.	Dew-point.
		°	°
at 6 17 30	1782	52·5	43·6
at 6 18 0	1929	52·5	41·6
at 6 19 0	2027	52·2	40·7
at 6 20 0	2027	52·8	41·5
at 6 21 0	1908	52·2	42·7
at 6 21 30	1829	53·0	41·0
at 6 21 45	1829	52·7	41·2
at 6 22 0	2017	52·5	42·0
Mean........	1917	52·6	41·8

These mean values at the mean height were laid down on a diagram; all these points were joined, and a curved line was drawn through, or near them, so that the areas of the space between the original and the adopted lines on one side were equal to those of the spaces on the other side. The curve thus formed was assumed to be the curve of temperature freed from local disturbance, and that it was assumed that the deviations of the original curve indicated the places and the amount of disturbance.

The next step was reading from these curves the temperature at every 100 feet, and in this way the next Tables were formed.

The numbers in the first column show the height in feet, beginning from the ground and increasing upwards; the numbers in the second column show the interval of time in ascending to the highest point; the notes in the third column show the circumstances of the observations; the numbers in the fourth and fifth columns, the observations and the approximate true temperatures of the air, and those in the next column the difference between the two preceding columns, or the most probable effect of local disturbing causes.

The next group of columns are arranged similarly for the descent, and the other groups, on May 29, for the second ascent and second descent.

TABLE III.—Showing the Temperature of the Air, as read off the curve drawn through the observed temperatures, and as read off the curve of most probable normal temperatures, called adopted temperatures, and the calculated amount of disturbance from the assumed law of decrease of temperature.

TWENTY-SIXTH ASCENT.

1865. October 2nd. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
			°	°	°			°	°	°
2000	From $6^h\ 20^m$ p.m. to $6^h\ 56^m$ p.m.	Generally clear.	59·8	59·8	0·0	From $6^h\ 57^m$ p.m. to $8^h\ 20^m$ p.m.	Misty and very dark.	59·8	59·8	0·0
1900			59·4	59·5	− 0·1			59·6	59·6	0·0
1800			59·1	59·3	− 0·2			59·4	59·5	− 0·1
1700			59·0	59·1	− 0·1			59·3	59·4	− 0·1
1600			58·9	58·9	0·0			59·2	59·3	− 0·1
1500			58·6	58·7	− 0·1			59·0	59·2	− 0·2
1400			58·1	58·5	− 0·4			59·0	59·0	0·0
1300			58·2	58·3	− 0·1			58·9	58·9	0·0
1200			58·3	58·1	+ 0·2			58·8	58·7	+ 0·1
1100			58·3	58·0	+ 0·3			58·7	58·6	+ 0·1
1000			58·2	57·7	+ 0·5			58·5	58·5	0·0
900			57·7	57·5	+ 0·2			58·3	58·3	0·0
800			57·4	57·4	0·0			57·8	58·2	+ 0·4
700			57·2	57·2	0·0			57·7	58·0	+ 0·3
600			57·0	57·0	0·0			57·4	57·8	+ 0·4
500			56·8	56·8	0·0			57·3	57·5	+ 0·2
400			56·7	56·7	0·0			57·3	57·3	0·0
300			56·5	56·5	0·0			57·0	57·0	0·0
200			56·3	56·3	0·0			56·7	56·7	0·0
100			56·1	56·1	0·0			56·4	56·4	0·0
0			56·0	55·8	+ 0·2			56·0	56·0	0·0

The temperature of the air was the lowest on the ground, and increased, with elevation, to the height of 2000 feet, the highest point attained; and on the descent it decreased with decrease of elevation, and was the lowest on reaching the ground.

TABLE III. (*continued*).

TWENTY-SEVENTH ASCENT.

1865. December 2. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
			°	°	°			°	°	°
4600			27·2	27·2	0·0			27·2	27·2	0·0
4500			27·2	27·2	0·0			27·2	27·4	−0·2
4400			27·2	27·2	0·0			27·3	27·5	−0·2
4300			27·2	27·2	0·0			27·6	27·7	−0·1
4200			27·2	27·2	0·0		Very cloudy above.	27·9	27·9	0·0
4100			27·3	27·3	0·0			28·2	28·2	0·0
4000			27·5	27·5	0·0			28·4	28·5	−0·1
3900			27·7	27·8	−0·1			28·6	28·7	−0·1
3800			28·3	28·4	−0·1			28·8	29·0	−0·2
3700			29·0	29·0	0·0			29·3	29·3	0·0
3600			29·6	29·6	0·0			29·7	29·7	0·0
3500		Cold to sense.	30·0	30·2	−0·2			30·5	30·0	+0·5
3400			30·8	30·8	0·0			30·6	30·3	+0·3
3300			31·4	31·6	−0·2			30·7	30·5	+0·2
3200			32·3	32·2	+0·1			30·9	30·9	0·0
3100			33·2	32·6	+0·6			31·2	31·2	0·0
3000			33·1	32·8	+0·3			31·4	31·4	0·0
2900			33·0	33·0	0·0			31·6	31·6	0·0
2800			33·0	33·2	−0·2			31·8	31·8	0·0
2700			33·5	33·4	+0·1	From 6^{h} 39^{m} 30^{s} p.m. to 7^{h} 10^{m} p.m.		32·0	32·0	0·0
2600			34·0	33·5	+0·5			32·3	32·3	0·0
2500	From 5^{h} 15^{m} p.m. to 6^{h} 39^{m} 30^{s} p.m.	Clouds below.	33·5	33·8	−0·3			32·4	32·6	−0·2
2400			34·0	34·1	−0·1					
2300			34·6	34·5	+0·1		Lamp extinguished.			
2200			35·5	35·0	+0·5					
2100			35·6	35·5	+0·1					
2000		Very cloudy; nothing visible.	35·6	36·0	−0·4					
1900			37·0	36·9	+0·1					
1800			37·2	37·2	0·0					
1700			36·9	36·9	0·0					
1600			36·5	36·6	−0·1					
1500			36·2	36·4	−0·2					
1400			36·1	36·2	−0·1					
1300			36·2	36·2	0·0					
1200			36·2	36·2	0·0					
1100			36·2	36·2	0·0					
1000			36·3	36·3	0·0					
900			36·3	36·3	0·0					
800			36·4	36·4	0·0					
700			36·4	36·4	0·0					
600			36·5	36·5	0·0					
500			36·5	36·5	0·0					
400			36·5	36·5	0·0					
300		Misty all round.	36·6	36·6	0·0					
200			37·1	37·1	0·0					
100			37·6	37·6	0·0					
0			38·5	38·5	0·0					

The temperature decreased from 38°·5 on the ground to 36°·6 at the height of 300 feet; was then very nearly stationary to the height of 1500 feet, de-

creasing to 36°·1 at this elevation; it then increased to 37°·2 at the height of 1800 feet, the sky being cloudy as seen from here, and the air was misty. In the next 100 feet the temperature declined 0°·2, and as much as 1°·4 in the succeeding 100 feet; the temperature then declined slowly to 34° at 2600 feet, the clouds being at a lower elevation: the decline of temperature continued to the height of 4000 feet, where it was 27½°, and there was very little change in the next 600 feet. On descending, the temperature slowly and steadily increased to 32°·4 at the height of 2500 feet, when the light was accidentally extinguished, and no more observations could be made.

TABLE III. (*continued*).

TWENTY-EIGHTH ASCENT.

1866. May 29. Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
			°	°	°			°	°	°
6400										
6300										
6200			29·8	29·8	0·0			30·2	30·0	+0·2
6100			30·2	30·6	−0·4			30·8	30·5	+0·3
6000			30·5	31·4	−0·9			31·4	30·8	+0·6
5900			30·8	32·3	−1·5			31·6	31·3	+0·3
5800			31·4	33·0	−1·6			31·8	31·6	+0·2
5700			35·2	34·0	+1·2			32·0	32·0	0·0
5600			35·2	34·5	+0·7			32·4	32·4	0·0
5500			35·2	35·0	+0·2			32·6	32·6	0·0
5400			35·6	35·6	0·0			33·0	33·0	0·0
5300			36·3	36·3	0·0			33·4	33·4	0·0
5200			36·9	36·9	0·0			33·7	33·7	0·0
5100			37·5	37·6	−0·1			34·0	34·0	0·0
5000			38·0	38·1	−0·1			34·3	34·3	0·0
4900			38·5	38·7	−0·2		Generally clear sky.	34·6	34·6	0·0
4800			39·0	39·3	−0·3	From 7^{h} 18^{m} p.m. to 8^{h} 9^{m} p.m.		34·9	34·9	0·0
4700	From 6^{h} 12^{m} p.m. to 7^{h} 18^{m} p.m.		39·5	39·9	−0·4			35·2	35·2	0·0
4600			40·2	40·6	−0·4			35·5	35·5	0·0
4500			41·2	41·2	0·0			35·7	35·7	0·0
4400		Misty.	42·0	41·8	+0·2			36·0	36·0	0·0
4300			42·6	42·3	+0·3			36·2	36·4	−0·2
4200			43·3	43·0	+0·3			36·3	36·7	−0·4
4100			43·7	43·5	+0·2			36·5	37·0	−0·5
4000			44·5	44·0	+0·5			36·7	37·3	−0·6
3900			45·2	44·5	+0·7			37·1	37·7	−0·6
3800			46·6	45·0	+1·6			37·4	37·9	−0·5
3700			46·8	45·6	+1·2			37·8	38·3	−0·5
3600			47·0	46·0	+1·0			38·2	38·6	−0·4
3500		Blue sky above. Sun warm to sense.	47·2	46·5	+0·7			38·5	38·9	−0·4
3400			48·7	46·9	+1·8			39·1	39·3	−0·2
3300			48·3	47·3	+1·0			39·6	39·5	+0·1
3200			47·5	47·5	0·0			40·0	39·9	+0·1
3100			46·7	48·0	−1·3			40·3	40·2	+0·1
3000			47·1	48·4	−1·3			40·6	40·6	0·0
2900			47·5	48·7	−1·2			40·7	40·7	0·c
2800			47·7	49·1	−1·4			41·1	41·1	0·c
2700			48·0	49·6	−1·6			41·4	41·5	−0·1

TABLE III. (*continued*).

TWENTY-EIGHTH ASCENT (*continued*).

1866. May 29 (*con.*). Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
2600	From 6^h 12^m p.m. to 7^h 18^m p.m.		48°·5	50°·0	−1°·5	From 7^h 18^m p.m. to 8^h 9^m p.m.	Generally clear sky.			
2500			48·9	50·3	−1·4			42°·0	41°·9	+0°·1
2400			49·3	50·7	−1·4			42·6	42·5	+0·1
2300			49·7	51·1	−1·4			43·4	42·8	+0·6
2200			50·5	51·5	−1·0			44·1	43·3	+0·8
2100			51·3	51·9	−0·6			44·3	43·8	+0·5
2000			52·0	52·3	−0·3			44·5	44·3	+0·2
1900			52·7	52·7	0·0			44·8	44·5	+0·3
1800			53·1	53·1	0·0			45·0	45·0	0·0
1700			53·5	53·5	0·0			45·3	45·3	0·0
1600			53·8	53·8	0·0			45·7	45·7	0·0
1500			54·3	54·3	0·0			46·2	46·2	0·0
1400			54·6	54·6	0·0			46·6	46·6	0·0
1300			55·0	55·0	0·0			47·1	47·1	0·0
1200			55·3	55·3	0·0			47·6	47·6	0·0
1100			55·5	55·5	0·0			47·8	48·0	−0·2
1000			55·8	55·8	0·0			48·1	48·5	−0·4
900			56·2	56·2	0·0			48·3	49·0	−0·7
800			56·4	56·4	0·0			48·8	49·5	−0·7
700			56·7	56·7	0·0			49·5	50·0	−0·5
600			57·0	57·0	0·0			50·7	50·5	+0·2
500			57·3	57·4	−0·1			51·8	51·0	+0·8
400			57·5	57·6	−0·1			53·6	51·8	+1·8
300			57·6	57·8	−0·2					
200			57·8	58·2	−0·4					
100			57·9	58·5	−0·6					
0			58·0	58·8	−0·8					

6400	From 8^h 9^m p.m. to 8^h 21^m 30^s p.m.	Sensibly damp and cold.	35·2	35·2	0·0	From 8^h 21^m 30^s p.m. to 9^h 25^m p.m.	Mist over the land; cannot see far.	35·2	35·3	−0·1
6300			34·3	35·4	−1·1			35·2	35·4	−0·2
6200			34·2	35·5	−1·3			35·5	35·5	0·0
6100			34·1	35·7	−1·6			35·7	35·6	+0·1
6000			34·6	36·0	−1·4			35·8	35·8	0·0
5900			35·4	36·3	−0·9			35·6	36·0	−0·4
5800			36·2	36·6	−0·4			35·6	36·1	−0·5
5700			37·0	36·8	+0·2			35·8	36·2	−0·4
5600			37·8	37·0	+0·8			36·1	36·3	−0·2
5500			38·3	37·3	+1·0			36·3	36·5	−0·2
5400			38·5	37·7	+0·8			36·5	36·6	−0·1
5300			38·6	37·9	+0·7			36·7	36·7	0·0
5200			38·7	38·2	+0·5			36·8	36·8	0·0
5100			38·8	38·5	+0·3			36·9	37·0	−0·1
5000			39·0	38·8	+0·2			37·0	37·2	−0·2
4900			39·0	39·0	0·0			37·0	37·4	−0·4
4800			39·0	39·4	−0·4			37·0	37·5	−0·5
4700			39·1	39·7	−0·6			37·1	37·7	−0·6
4600			39·1	40·0	−0·9			37·2	38·0	−0·8
4500			39·2	40·4	−1·2			37·4	38·3	−0·9
4400			39·2	40·7	−1·5			37·6	38·4	−0·8

TABLE III. (*continued*).

TWENTY-EIGHTH ASCENT (*continued*).

1866. May 29 (*con.*). Height, in feet, above the mean level of the sea.	Temperature of the Air. Ascending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.	Descending. Between what times.	Circumstances.	Observed temp.	Adopted temp.	Calculated effect of disturbance.
4300	From 8^h 9^m p.m. to 8^h 21^m 30^s p.m.		39°·5	41°·0	−1°·5	From 8^h 21^m 30^s to 9^h 25^m p.m.		37°·8	38°·6	−0°·8
4200			40·0	41·2	−1·2			38·2	38·8	−0·6
4100			40·5	41·5	−1·0			38·4	39·1	−0·7
4000			41·0	41·8	−0·8			38·6	39·3	−0·7
3900			41·5	42·2	−0·7			38·9	39·5	−0·6
3800			42·0	42·5	−0·5			39·2	39·7	−0·5
3700			42·5	42·8	−0·3			39·5	40·0	−0·5
3600			42·9	43·1	−0·2			39·9	40·2	−0·3
3500			43·4	43·5	−0·1			40·4	40·5	−0·1
3400			43·8	43·8	0·0			40·7	40·7	0·0
3300			44·3	44·3	0·0			41·1	41·0	+0·1
3200			44·7	44·5	+0·2			41·9	41·4	+0·5
3100			45·2	44·7	+0·5			42·7	41·7	+1·0
3000			45·6	45·1	+0·5			43·4	42·0	+1·4
2900			46·0	45·5	+0·5			43·9	42·4	+1·5
2800			46·3	45·9	+0·4			44·1	42·7	+1·4
2700			46·6	46·3	+0·3			44·3	43·1	+1·2
2600			47·0	46·7	+0·3			44·5	43·5	+1·0
2500			47·5	47·0	+0·5			44·8	43·8	+1·0
2400			47·8	47·4	+0·4			45·0	44·2	+0·8
2300			48·1	47·7	+0·4			45·3	44·6	+0·7
2200			48·5	48·2	+0·3			45·5	45·1	+0·4
2100			48·7	48·5	+0·2			45·6	45·5	+0·1
2000			49·1	48·9	+0·2			46·0	46·0	+0·0
1900			49·4	49·3	+0·1			46·4	46·4	0·0
1800			49·7	49·6	+0·1			46·8	46·8	0·0
1700			50·0	49·9	+0·1			47·2	47·2	0·0
1600			50·3	50·3	0·0			47·5	47·5	0·0
1500			50·6	50·6	0·0			48·0	48·0	0·0
1400			51·0	51·0	0·0			48·3	48·3	0·0
1300			51·4	51·4	0·0			48·7	48·7	0·0
1200			51·7	51·7	0·0			49·5	49·0	+0·5
1100			52·0	52·0	0·0			50·7	49·5	+1·2
1000			52·3	52·3	0·0			51·9	50·0	+1·9
900			52·7	52·7	0·0			53·0	50·5	+2·5
800			53·0	53·0	0·0			53·6	51·0	+2·6
700			53·4	53·4	0·0			53·8	51·4	+2·4
600			53·5	53·5	0·0			53·0	51·9	+1·1
500			54·0	54·0	0·0			52·5		
400								52·1		
300								51·6		
200								51·1		
100								50·6		
0								50·1		

The temperature of the air declined from 58°·0 on the ground to 52° at 2000 feet, and somewhat more rapidly to 46°·7 at 3000 feet; it increased to 48°·7, or by 2° in the next 400 feet, and then gradually declined to 29°·8 at the height of 6200 feet. On descending, the temperature increased gradually to 48°·3 at 1000 feet, and then much more rapidly to 53°·6 at the height of 500 feet: this rapid increase was remarkable. On turning to ascend the sun having set, the temperature declined pretty equally to the height of 4000 feet, and at greater heights, with somewhat less regularity, to 34° at 6000 feet, when the temperature increased to 35°·3 at the height of 6400 feet: this increase was very remarkable. On descending again, the temperature increased with moderate regularity to 48°·7 at the height of 1300 feet, and then with much greater rapidity to 53°·8 at the height of 600 feet, when the increase was arrested, and the temperature at lower elevations rapidly declined, on approaching the earth, to 50°·1. This decline of temperature from 600 feet is remarkable. By comparing the readings at the same heights before and after sunset, it will be seen that at the height of 6000 feet, the temperature was from 5° to 6° warmer after sunset than it was before sunset, and that the temperatures on the ground, and at 1000 feet high, were nearly the same, whilst at intermediate heights they were much higher.

Table VI.—Showing the Decrease of Temperature with every increase of 100 feet up to 6400 feet.

Height, in feet, above the level of the sea.		Oct. 2, 1865.		Dec. 2, 1865.		May 29, 1866.			
		State of the Sky.							
		Clear.		Cloudy.		Partially clear and cloudy.			
From	To	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.
feet.	feet.	°	°	°	°	°	°	°	°
6300	6400	...	...	...	...	...	...	0·2	0·1
6200	6300	...	...	...	...	...	...	0·1	0·1
6100	6200	...	...	...	...	0·8	0·5	0·2	0·1
6000	6100	...	...	...	...	0·8	0·3	0·3	0·2
5900	6000	...	...	...	...	0·9	0·5	0·3	0·2
5800	5900	...	...	...	...	0·7	0·3	0·3	0·1
5700	5800	...	...	...	...	1·0	0·4	0·2	0·1
5600	5700	...	...	...	...	0·5	0·4	0·2	0·1
5500	5600	...	...	...	...	0·5	0·2	0·3	0·2
5400	5500	...	...	...	...	0·6	0·4	0·4	0·1
5300	5400	...	...	...	...	0·7	0·4	0·2	0·1
5200	5300	...	...	...	...	0·6	0·3	0·3	0·1
5100	5200	...	...	...	...	0·7	0·3	0·3	0·2
5000	5100	...	...	...	...	0·5	0·3	0·3	0·2
4900	5000	...	...	...	...	0·6	0·3	0·2	0·2
4800	4900	...	...	...	...	0·6	0·3	0·4	0·1
4700	4800	...	...	...	...	0·6	0·3	0·3	0·2
4600	4700	...	...	...	...	0·7	0·3	0·3	0·3
4500	4600	...	...	0·0	0·2	0·6	0·2	0·4	0·3

Table VI. (*continued*).

Height, in feet, above the level of the sea.		Oct. 2, 1865.		Dec. 2, 1865.		May 29, 1866.			
		State of the Sky.							
		Clear.		Cloudy.		Partially clear and cloudy.			
From	To	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.	Ascending.	Descending.
feet.	feet.	°	°	°	°	°	°	°	°
4400	4500	...	...	0·0	0·1	0·6	0·3	0·3	0·1
4300	4400	...	...	0·0	0·2	0·5	0·4	0·3	0·2
4200	4300	...	...	0·0	0·2	0·7	0·3	0·2	0·2
4100	4200	...	...	0·1	0·3	0·5	0·3	0·3	0·3
4000	4100	...	...	0·2	0·3	0·5	0·3	0·3	0·2
3900	4000	...	...	0·3	0·2	0·5	0·4	0·4	0·2
3800	3900	...	...	0·6	0·3	0·5	0·2	0·3	0·2
3700	3800	...	...	0·6	0·3	0·6	0·4	0·3	0·3
3600	3700	...	...	0·6	0·4	0·4	0·3	0·3	0·2
3500	3600	...	...	0·6	0·3	0·5	0·3	0·4	0·3
3400	3500	...	...	0·6	0·3	0·4	0·4	0·3	0·2
3300	3400	...	...	0·8	0·2	0·4	0·2	0·5	0·3
3200	3300	...	...	0·6	0·4	0·2	0·4	0·2	0·4
3100	3200	...	...	0·4	0·3	0·5	0·3	0·2	0·3
3000	3100	...	...	0·2	0·2	0·4	0·4	0·4	0·3
2900	3000	...	...	0·2	0·2	0·3	0·1	0·4	0·4
2800	2900	...	...	0·2	0·2	0·4	0·4	0·4	0·3
2700	2800	...	...	0·2	0·2	0·5	0·4	0·4	0·4
2600	2700	...	...	0·1	0·3	0·4	0·4	0·4	0·4
2500	2600	...	...	0·3	0·3	0·3	0·6	0·3	0·3
2400	2500	...	...	0·3	...	0·4	0·3	0·4	0·4
2300	2400	...	...	0·4	...	0·4	0·5	0·3	0·4
2200	2300	...	...	0·5	...	0·4	0·5	0·5	0·5
2100	2200	...	...	0·5	...	0·4	0·5	0·3	0·3
2000	2100	...	...	0·5	...	0·4	0·2	0·4	0·5
1900	2000	...	...	0·9	...	0·4	0·5	0·4	0·4
1800	1900	−0·2	−0·1	−0·3	...	0·4	0·3	0·3	0·4
1700	1800	−0·2	−0·1	−0·3	...	0·4	0·4	0·3	0·4
1600	1700	−0·2	−0·1	−0·3	...	0·3	0·5	0·4	0·3
1500	1600	−0·2	−0·1	−0·2	...	0·5	0·4	0·3	0·5
1400	1500	−0·2	−0·2	−0·2	...	0·3	0·5	0·4	0·3
1300	1400	−0·2	−0·1	0·0	...	0·4	0·5	0·4	0·4
1200	1300	−0·2	−0·2	0·0	...	0·3	0·4	0·3	0·3
1100	1200	−0·1	−0·1	0·0	...	0·2	0·5	0·3	0·5
1000	1100	−0·3	−0·1	0·1	...	0·3	0·5	0·3	0·5
900	1000	−0·2	−0·2	0·0	...	0·4	0·5	0·4	0·5
800	900	−0·1	−0·1	0·1	...	0·2	0·5	0·3	0·5
700	800	−0·2	−0·2	0·0	...	0·3	0·5	0·4	0·4
600	700	−0·2	−0·2	0·1	...	0·3	0·5	0·1	0·5
500	600	−0·2	−0·3	0·0	...	0·4	0·8	0·5	0·4
400	500	−0·1	−0·2	0·0	...	0·2	...	...	0·3
300	400	−0·2	−0·3	0·1	...	0·2	...	...	0·4
200	300	−0·2	−0·3	0·5	...	0·4	...	...	0·5
100	200	−0·2	−0·3	0·5	...	0·3	...	...	0·5
0	100	−0·3	−0·4	0·9	...	0·3	...	...	0·5

The sign — denotes an increasing temperature with increase of elevation.

TABLE VII.—Showing the Variation of the Hygrometric condition of the Air at every 100 feet of height.

TWENTY-SIXTH ASCENT.

1865. October 2. Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
			°	in.				°	in.	
2000	From $6^h\ 20^m$ p.m. to $6^h\ 56^m$ p.m.	Generally clear sky.	58·0	......	94	From $6^h\ 57^m$ p.m. to $8^h\ 20^m$ p.m.	Misty and very dark.			
1900			57·7	·477	94			57·8	·479	92
1800			57·6	·475	95			57·6	·475	93
1700			57·3	·470	95			57·5	·473	93
1600			57·1	·467	94			57·5	·473	94
1500			57·0	·465	94			57·4	·472	95
1400			56·9	·464	96			57·1	·467	94
1300			56·5	·457	94			56·9	·464	94
1200			55·9	·447	93			56·7	·461	93
1100			55·4	·439	90			55·5	·441	89
1000			55·4	·439	90			53·9	·416	83
900			56·0	·449	92			54·6	·427	86
800			56·1	·451	94			54·4	·424	86
700			55·8	·446	95			54·3	·422	86
600			55·5	·441	94			54·5	·425	88
500			55·3	·437	94			55·0	·433	91
400			55·0	·433	93			54·8	·430	93
300			54·7	·428	92			54·9	·431	93
200			54·5	·425	93			55·0	·433	93
100			54·2	·421	93			55·1	·434	94
0			54·0	·418	93			55·2	·436	96

The temperature of the dew-point increased on ascending to the height of 900 feet, then decreased, the air becoming drier, or the degree of humidity less; at heights exceeding 1200 feet, the degree of humidity was nearly the same as at heights less than 900 feet. On descending, the temperature of the dew-point decreased, and the air was driest at about the height of 1000 feet; at heights less than 1000 feet the temperature of the dew-point increased, and the degree of humidity increased till the ground was reached.

TWENTY-SEVENTH ASCENT.

December 2.	Between what times (ascending).	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Between what times (descending).	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
4600	From $5^h\ 15^m$ p.m. to $6^h\ 39^m\ 30^s$ p.m.		21·7	·116	79	From $6^h\ 39^m\ 30^s$ p.m. to $7^h\ 10^m$ p.m.		21·7	·116	79
4500			21·7	·116	79			21·2	·114	77
4400			21·7	·116	79			21·5	·115	78
4300			22·4	·120	81			24·1	·130	86
4200			23·0	·123	84		Very cloudy above.	25·2	·136	88
4100			22·5	·120	83			24·8	·134	87
4000			20·8	·112	75			24·6	·133	84
3900			20·0	·108	70			24·3	·131	83
3800			20·0	·108	68			24·1	·130	80
3700			21·0	·113	71			24·7	·133	81
3600			23·0	·123	75			25·5	·138	82
3500		Cold to sense.	24·4	·131	78			27·0	·147	85

TABLE VII. (*continued.*)

TWENTY-SEVENTH ASCENT (*continued*).

1865. December 2. Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
			°	in.				°	in.	
3400	From $5^h\ 15^m$ p.m. to $6^h\ 39^m\ 30^s$ p.m.		25·4	·137	78	From $6^h\ 39^m\ 30^s$ p.m. to $7^h\ 10^m$ p.m.		25·5	·138	79
3300			27·3	·149	83			27·9	·152	88
3200			29·1	·160	88			28·3	·155	91
3100			30·4	·170	89			28·6	·157	90
3000			31·8	·179	95			29·0	·160	89
2900			31·8	·179	95			29·4	·162	91
2800			31·4	·176	94			29·6	·164	92
2700			32·4	·184	95			30·0	·167	92
2600		Clouds below.	34·0	·196	100			30·3	·169	92
2500			32·8	·186	96		Lamp extinguished.	30·7	·172	92
2400			33·5	·192	98					
2300			33·9	·195	98					
2200			34·2	·197	97					
2100			34·5	·199	97					
2000			35·1	·204	98					
1900			36·7	·218	99					
1800		Very cloudy; nothing visible.	36·7	·218	99					
1700			36·4	·215	99					
1600			36·1	·213	99					
1500			35·8	·210	99					
1400			35·7	·209	99					
1300			35·7	·209	99					
1200			35·7	·209	99					
1100			35·7	·209	99					
1000			35·7	·209	98					
900			35·7	·209	98					
800			35·7	·209	98					
700			35·7	·209	98					
600			35·7	·209	98					
500			35·7	·209	98					
400			35·7	·209	98					
300		Misty all round.	35·7	·209	98					
200			36·3	·214	98					
100			37·0	·220	98					
0			37·5	·225	98					

The temperature of the dew-point on the ground and to the height of 1800 feet was very little below that of the air, and consequently the air was nearly saturated with moisture, and was quite so at 1900 feet high; after this the temperature of the dew-point was again a little below that of the air, till 2600 feet was reached, when the air was again saturated; at heights exceeding this the two temperatures separated more and more, till at 3800 feet high the air was the driest, the degree of humidity being 68 only. At heights exceeding 3900 feet the air became somewhat more damp to 4200 feet high, and then again somewhat less so at 4600 feet.

TABLE VII. (*continued*).

TWENTY-EIGHTH ASCENT.

1866. May 29. Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
			°	in.				°	in.	
6400	From 6h 12m to 7h 18m p.m.					From 7h 18m to 8h 9m p.m.	Generally clear sky.			
6300										
6200			23·5	·126	76			21·8	·117	69
6100			24·2	·130	77			21·4	·115	66
6000			25·0	·135	78			21·7	·116	65
5900			25·8	·140	80			24·3	·131	72
5800			26·5	·144	81			26·3	·143	79
5700			32·1	·182	86			28·0	·153	84
5600			32·1	·182	86			27·8	·152	84
5500			32·1	·182	86			27·7	·151	83
5400			32·4	·184	85			27·6	·151	80
5300			32·8	·186	86			27·4	·149	78
5200			33·2	·189	87			27·3	·149	77
5100			33·6	·193	86			27·2	·148	76
5000			34·5	·199	87			27·3	·149	74
4900			35·5	·208	88			27·9	·152	74
4800			36·3	·214	91			28·5	·156	77
4700			37·3	·223	90			29·1	·160	78
4600			38·0	·229	90			29·7	·165	77
4500			37·0	·220	84			30·2	·168	77
4400		Misty.	36·0	·212	82			30·8	·172	82
4300			35·6	·208	75			31·4	·176	83
4200			35·6	·208	70			32·1	·182	84
4100			35·6	·208	68			32·8	·186	84
4000			35·6	·208	68			33·2	·189	85
3900			35·6	·208	69			33·4	·191	87
3800			36·1	·213	65			33·6	·193	85
3700			35·7	·209	64			33·8	·194	82
3600			35·5	·208	64			34·0	·196	84
3500		Blue sky above. Sun warm to sense.	35·2	·205	63			34·1	·196	82
3400			34·6	·200	57			34·0	·196	83
3300			35·1	·204	59			34·0	·196	79
3200			37·0	·220	67			33·9	·195	79
3100			40·9	·256	78			34·0	·196	78
3000			40·5	·252	79			34·0	·196	76
2900			40·1	·248	75			34·0	·196	79
2800			39·8	·245	73			34·0	·196	77
2700			39·6	·243	73			34·0	·196	75
2600			39·6	·243	70			34·3	·198	75
2500			39·7	·244	68			34·7	·201	74
2400			39·7	·244	68			35·1	·204	70
2300			40·0	·247	67			35·5	·208	70
2200			40·4	·251	67			35·6	·208	70
2100			40·9	·256	66			35·7	·209	70
2000			41·5	·262	70			35·8	·210	70
1900			42·0	·269	65			35·8	·210	69
1800			43·7	·285	70			35·0	·204	64
1700			45·5	·305	74			36·1	·213	67

TABLE VII. (*continued*).

TWENTY-EIGHTH ASCENT (*continued*).

1866. May 29. Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
			°	in.				°	in.	
1600	From 6h 12m to 7h 18m p.m.		46·2	·313	73	From 7h 18m p.m. to 8h 9m p.m.	Generally clear sky.	36·3	·214	69
1500			47·5	·329	76			36·5	·216	67
1400			48·7	·344	76			36·7	·218	68
1300			49·9	·360	83			36·9	·219	66
1200			50·8	·371	85			37·1	·221	65
1100			51·1	·375	85			37·5	·225	67
1000			51·5	·381	85			37·8	·227	66
900			51·8	·385	85			39·0	·238	66
800			52·2	·391	85			40·0	·247	68
700			52·6	·397	86			40·5	·252	67
600			53·0	·403	86			40·9	·256	64
500			53·0	·403	86			41·5	·262	63
400			52·8	·401	83					
300			52·7	·399	82					
200			52·5	·396	81					
100			52·4	·394	81					
0			52·4	·394	81					

6400	From 8h 9m p.m. to 8h 21m 30s p.m.	Sensibly damp and cold.	34·5	·199	98	From 8h 21m 30s p.m. to 9h 25m p.m.	Mist over the earth; cannot see far.	34·6	·200	97
6300			34·1	·196	100			34·5	·199	97
6200			33·8	·194	99			33·4	·191	93
6100			33·7	·193	99			32·5	·184	82
6000			34·0	·196	99			32·3	·183	81
5900			35·0	·204	99			32·1	·182	84
5800			35·8	·210	99			31·9	·180	83
5700			36·6	·217	99			31·7	·179	82
5600			37·5	·225	99			31·5	·177	83
5500			38·2	·231	100			31·3	·176	81
5400			38·2	·231	99			31·1	·174	79
5300			38·2	·231	99			31·0	·174	77
5200			38·1	·230	99			31·2	·175	76
5100			38·0	·229	97			31·4	·176	79
5000			37·8	·227	96			31·7	·179	82
4900			37·7	·226	96			32·0	·181	83
4800			37·5	·225	95			32·3	·183	83
4700			37·3	·223	94			32·5	·184	84
4600			37·2	·222	94			32·9	·187	84
4500			36·9	·219	92			33·3	·190	84
4400			36·8	·218	92			33·5	·192	83
4300			37·0	·220	92			33·8	·194	82
4200			37·4	·224	91			34·0	·196	84
4100			37·7	·226	90			34·3	·198	84
4000			38·0	·229	90			34·6	·200	83
3900			38·5	·233	89			34·9	·203	85
3800			38·8	·236	89			35·1	·204	86
3700			39·0	·238	87			35·1	·204	83
3600			39·0	·238	86			34·8	·202	82
3500			39·0	·238	83			34·5	·199	80
3400			39·0	·238	81			34·2	·197	76

TABLE VII. (*continued*).

TWENTY-EIGHTH ASCENT (*continued*).

1866. May 29. Height, in feet, above the mean level of the sea.	Humidity of the Air. Ascending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.	Descending. Between what times.	Circumstances.	Temperature of the dew-point.	Elastic force of vapour.	Degree of humidity.
			°	in.				°	in.	
3300	From 8^h 9^m p.m. to 8^h 21^m 30^s p.m.		39·0	·238	87	From 8^h 21^m 30^s p.m. to 9^h 25^m p.m.		34·5	·199	78
3200			38·9	·237	77			35·0	·204	77
3100			38·9	·237	77			35·8	·210	76
3000			38·9	·237	75			36·5	·216	76
2900			38·9	·237	77			36·9	·219	79
2800			38·8	·236	76			37·0	·220	76
2700			38·8	·236	75			37·0	·220	75
2600			38·8	·236	74			37·0	·220	75
2500			38·8	·236	73			37·0	·220	74
2400			38·8	·236	72			37·1	·221	74
2300			38·8	·236	71			37·1	·221	73
2200			38·8	·236	70			37·1	·221	73
2100			39·0	·238	69			37·2	·222	73
2000			39·3	·240	69			37·3	·223	73
1900			39·5	·242	69			37·8	·227	73
1800			39·8	·245	69			38·3	·231	73
1700			40·2	·249	69			38·8	·236	73
1600			40·4	·251	69			39·2	·239	72
1500			40·7	·254	69			39·5	·242	72
1400			40·8	·255	68			40·1	·248	71
1300			40·8	·255	68			40·5	·252	71
1200			40·9	·256	67			41·0	·257	70
1100			40·9	·256	67			42·0	·267	71
1000			41·0	·257	66			42·8	·275	71
900			41·2	·259	66			43·8	·286	71
800			41·3	·260	65			43·8	·286	68
700			41·5	·262	64			43·0	·277	61
600			41·5	·262	63			40·0	·247	61
500			41·7	·264	63			39·9	·246	62
400								39·8	·245	64
300								39·7	·244	64
200								39·6	·243	65
100								39·6	·243	66
0								39·5	·242	68

The degree of humidity of the air increased from the ground to the height of 500 feet; from this height to 1200 feet the air was somewhat less humid, and still less so at heights exceeding 1200 feet. At the height of 3400 feet the degree of humidity was 57 only; the air was again wet at 4800 feet, and somewhat less so at heights exceeding 5000 feet. On descending, the humidity of the air was more uniform down to the height of 3400 feet, and below this the air was less humid than at the same elevations on the ascent, and particularly at low elevations. On descending below 400 feet, I packed up the instruments, for fear of the balloon striking the ground; at this time the sun was setting. On ascending again, after sunset, the air was more and more humid, and most so at 6300 feet; and the same we found in the descent, to the height of 600 feet, where the degree of humidity was 61, and it increased to 68 on the ground.

TABLE VIII.—Showing the degree of Humidity at every 200 feet.

Height above the level of the sea.	Oct. 2, 1865. State of the Sky. Clear. Ascending.	Oct. 2, 1865. Clear. Descending.	Dec. 2, 1865. Cloudy. Ascending.	Dec. 2, 1865. Cloudy. Descending.	May 29, 1866. Partially clear and cloudy. Ascending.	Descending.	Ascending.	Descending.
feet.								
6400	..	..	..	..	..	..	98	97
6200	..	..	..	..	76	69	99	93
6000	..	..	..	..	78	65	99	81
5800	..	..	..	..	81	79	99	83
5600	..	..	..	..	86	84	99	83
5400	..	..	..	..	85	80	99	79
5200	..	..	..	..	87	77	99	76
5000	..	..	..	..	87	74	96	82
4800	..	..	..	..	91	77	95	83
4600	..	..	79	79	90	77	94	84
4400	..	..	79	78	82	82	92	83
4200	..	..	84	88	70	84	91	84
4000	..	..	75	84	68	85	90	83
3800	..	..	68	80	65	85	89	86
3600	..	..	75	82	64	84	86	82
3400	..	..	78	79	57	83	81	76
3200	..	..	88	91	67	79	77	77
3000	..	..	95	89	79	76	75	76
2800	..	..	94	92	73	77	76	76
2600	..	..	100	92	70	75	74	75
2400	..	..	98	..	68	70	72	74
2200	..	..	97	..	67	70	70	73
2000	..	..	98	..	60	70	69	73
1800	95	93	99	...	70	64	69	73
1600	94	94	99	..	73	69	69	72
1400	96	94	99	..	76	68	68	71
1200	93	93	99	..	85	65	67	70
1000	90	83	98	..	85	66	66	71
800	94	86	98	..	85	68	65	68
600	94	88	98	..	86	64	63	61
400	93	93	98	..	83	...	..	64
200	93	93	98	..	81	..	..	65
0	93	96	98	..	81	..	..	68

Meteorological Observations made in connexion with the Balloon Ascent on October 2, 1865.—Royal Observatory, Greenwich.

Time of observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
6 0 p.m.	29·840	60·0	57·2	54·8	·430	83	E.S.E.	0	0	Cloudless; a very fine bright evening; dew.
6 10 ”	29·840	60·0	57·2	54·8	·430	83	E.S.E.	0	0	
6 20 ”	29·842	59·9	57·2	54·9	·431	84	E. by S.	0	0	
6 30 ”	29·843	59·5	57·1	55·0	·433	86	E.S.E.	0	0	Cloudless. Balloon first seen 6h 30m 15s. Due East of observatory.
6 40 ”	29·845	59·3	57·1	55·1	·434	87	E.S.E.	0	0	Cloudless. Balloon passed N. of the observatory about 6h 38m.
6 50 ”	29·845	59·3	57·1	55·1	·434	87	E. by S.	0	0	Cloudless. Balloon last seen at 6h 46m, moving in a due Westerly direction—disappeared in the gloom of London.
7 0 ”	29·849	59·0	57·1	55·4	·439	89	E.S.E.	0	0	Cloudless. Heavy dew.
7 10 ”	29·853	58·6	57·0	55·6	·443	89	E. by S.	0	0	
7 20 ”	29·856	58·5	57·0	55·7	·444	90	E.	0	0	
7 30 ”	29·860	58·2	56·8	55·5	·441	91	E. by N.	0	0	
7 40 ”	29·869	57·4	56·2	55·1	·434	92	E.N.E.	0	0	
7 50 ”	29·870	57·2	56·2	55·3	·437	93	E. by N.	0	0	
8 0 ”	29·873	56·7	56·0	55·4	·439	95	E.	0	0	
8 10 ”	29·873	56·7	55·9	55·2	·436	94	E. by N.	0	0	
8 20 ”	29·873	56·0	55·6	55·2	·436	97	E.	0	0	
8 30 ”	29·880	55·7	55·2	54·8	·430	97	E.	0	0	
8 40 ”	29·887	55·5	55·0	54·6	·427	96	E.	0	0	
8 50 ”	29·888	55·6	55·0	54·5	·425	96	E.	0	0	
9 0 ”	29·892	55·6	55·0	54·5	·425	96	E.	0	1	

December 2, 1865.—Royal Observatory, Greenwich.

5 0 p.m.	29·594	38·6	37·1	35·2	·205	88	S.E.	6	0	Cirrus and cirrostratus. Dew falling rapidly.
5 10 ”	29·593	39·0	37·4	35·3	·206	87	……	8	0	
5 20 ”	29·593	39·1	37·6	35·7	·209	88	……	9	0	
5 30 ”	29·592	39·1	37·8	35·7	·209	88	……	10	0	The sky is covered with clouds.
5 40 ”	29·590	39·1	37·8	35·7	·209	88	……	10	0	
5 50 ”	29·588	39·2	38·0	36·4	·215	90	……	10	0	
6 0 ”	29·579	39·1	38·0	36·6	·217	91	……		0	Generally overcast with cirrostratus and cumulostratus, clouds broken in S.E.
6 10 ”	29·576	39·0	37·9	36·5	·216	91	……	10	0	Generally overcast, clouds broken in zenith.
6 20 ”	29·576	39·0	38·0	36·7	·218	92	……	10	0	
6 30 ”	29·575	39·4	38·4	37·1	·221	92	……	10	0	Overcast.
6 40 ”	29·573	39·7	38·6	37·2	·222	92	……	10	0	Generally overcast, clouds broken in S.E.
6 50 ”	29·571	39·8	38·7	36·7	·218	92	……	10	0	
7 0 ”	29·571	40·1	38·9	37·4	·224	90	……	10	0	
7 10 ”	29·570	40·2	39·0	37·5	·225	90	……	10	0	Overcast.
7 20 ”	29·568	40·7	39·4	37·8	·227	90	……	10	0	
7 30 ”	29·566	40·9	39·4	37·9	·228	88	……	10	0	
7 40 ”	29·563	41·0	39·3	37·2	·222	86	……	10	0	

Meteorological Observations made in connexion with the Balloon Ascent on May 29, 1866.—Royal Observatory, Greenwich.

Time of observation.	Reading of Barom. reduced to 32° F.	Reading of Thermom. Dry.	Reading of Thermom. Wet.	Temp. of the dew-point.	Tension of vapour.	Degree of humidity.	Direction of wind.	Amount of cloud 0–10.	Amount of ozone.	Remarks.
h m	in.	°	°	°	in.					
6 0 p.m.	29·703	59·3	50·3	42·3	·270	53	N. by E.	8	2	Cirrostratus and cirrocumulus.
6 10 ”	29·704	58·7	49·4	41·1	·258	53	……	7	3	Sun obscured.
6 20 ”	29·707	58·4	49·0	40·6	·253	53	……	6	3	Sun shining.
6 30 ”	29·708	57·9	49·0	41·0	·257	57	……	5	3	Sun shining.
6 40 ”	29·713	57·6	49·0	41·2	·259	57	……	6	3	Sun obscured.
6 50 ”	29·717	57·5	49·0	41·3	·260	57	……	6	3	
7 0 ”	29·718	57·2	48·9	41·0	·260	56	N.	6	3	Sun shining.
7 10 ”	29·721	56·1	48·0	40·4	·251	55	……	6	3	Sun obscured.
7 20 ”	29·729	56·0	47·8	40·0	·247	57	……	8	3	
7 30 ”	29·729	56·8	48·0	40·7	·254	57	……	9	3	Cirrostratus.
7 40 ”	29·729	55·4	47·6	40·2	·249	57	……	9	3	Overcast nearly.
7 50 ”	29·742	55·1	47·1	39·4	·241	56	……	9	3	
8 0 ”	29·742	54·6	47·0	39·6	·243	58	……	9	3	
8 10 ”	29·752	54·5	47·0	39·7	·244	59	……	9	3	
8 20 ”	29·758	54·4	46·9	39·6	·243	59	……	10	3	Overcast.
8 30 ”	29·759	53·8	46·4	39·2	·239	59	……	10	3	
8 40 ”	29·760	53·5	46·6	39·8	·245	60	……	10	3	
8 50 ”	29·762	53·1	46·0	38·9	·237	59	……	10	3	
9 0 ”	29·763	53·2	46·0	38·8	·236	59	……	10	3	
9 10 ”	29·765	52·7	45·7	38·7	·235	60	……	10	3	
9 20 ”	29·769	52·4	45·0	37·5	·225	57	……	10	3	
9 30 ”	29·772	52·1	44·6	37·0	·220	57	N. by E.	10	3	

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Remark on exception p 274 + 6.6

Tables XI